AC Drive Parameters

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GS1 Parameter Summary

Parameter Summary				
GS1 Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Motor Parameters				
P0.00	Motor Nameplate Voltage	200/208/220/230/240	240	
P0.01	Motor Nameplate Amps	Drive Rated Amps x 0.3 to 1.0	Drive Rated Amps x 1.0	
P0.02	Motor Base Frequency	50/60/400	60	
P0.03	Motor Base RPM	375 to 9999 RPM	1750	
P0.04	Motor Maximum RPM	P0.03 to 9999 RPM	P0.03	
Ramp Parameters				
P1.00	Stop Methods	0: Ramp to Stop 1: Coast to Stop	0	
◆ **P1.01**	Acceleration Time 1	0.1 to 600.0 sec	10.0	
◆ **P1.02**	Deceleration Time 1	0.1 to 600.0 sec	30.0	
P1.03	Accel S-curve	0 to 7	0	
P1.04	Decel S-curve	0 to 7	0	
◆ **P1.05**	Acceleration Time 2	0.1 to 600.0 sec	10.0	
◆ **P1.06**	Deceleration Time 2	0.1 to 600.0 sec	30.0	
P1.07	Select method to use 2nd Accel/Decel	0: RMP2 from terminal 1: Transition Frequencies P1.08 & P1.09	0	
P1.08	Accel 1 to Accel 2 frequency transition	0.0 to 400.0 Hz	0.0	
P1.09	Decel 1 to Decel 2 frequency transition	0.0 to 400.0 Hz	0.0	
P1.10	Skip Frequency 1	0.0 to 400.0 Hz	0.0	
P1.11	Skip Frequency 2	0.0 to 400.0 Hz	0.0	
P1.12	Skip Frequency 3	0.0 to 400.0 Hz	0.0	
P1.17	Skip Frequency Band	0.0 to 20.0 Hz	0.0	
P1.19	DC Injection Voltage Level	0 to 30%	0	
P1.20	DC Injection during Start-up	0.0 to 5.0 sec	0.0	
P1.21	DC Injection during Stopping	0.0 to 25.0 sec	0.0	
P1.22	Start-point for DC Injection	0.0 to 60.0 Hz	0.0	
◆ Parameter can be set during RUN Mode.				

Parameter Summary (continued)				
GS1 Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Volts/Hertz Parameters				
P2.00	Volts/Hertz Settings	0: General Purpose 1: High Starting Torque 2: Fans and Pumps 3: Custom	0	
◆ **P2.01**	Slip Compensation	0.0 to 10.0	0.0	
◆ **P2.03**	Manual Torque Boost	0 to 10%	1	
P2.04	Mid-point Frequency	1.0 to 400 Hz	1.5	
P2.05	Mid-point Voltage	2.0 to 255V	10.0	
P2.06	Min. Output Frequency	1.0 to 20.0 Hz	1.5	
P2.07	Min. Output Voltage	2.0 to 50V	10.0	
P2.08	PWM Carrier Frequency	03 to 10 kHz	10	

Digital Parameters				
P3.00	Source of Operation Command	0: Operation determined by digital keypad 1: Operation determined by external control terminals, keypad STOP is enabled 2: Operation determined by external control terminals, keypad STOP is disabled 3: Operation determined by RS-485 interface, keypad STOP is enabled 4: Operation determined by RS-485 interface, keypad STOP is disabled	0	
P3.01	Multi-function Inputs 1 & 2 (DI1 - DI2)	0: DI1 - FWD / STOP, DI2 - REV / STOP 1: DI1 - RUN / STOP, DI2- REV / FWD 2: DI1 - RUN momentary (N.O.) DI2 - REV / FWD DI3 - STOP momentary (N.C.)	0	
P3.02	Multi-function Input 3 (DI3)	0: External Fault (N.O.) 1: External Fault (N.C.) 2: External Reset 3: Multi-Speed Bit 1 4: Multi-Speed Bit 2 9: Jog 10: External Base Block (N.O.) 11: External Base Block (N.C.) 12: Second Accel/Decel Time 13: Speed Hold 14: Increase Speed 15: Decrease Speed 16: Reset Speed to Zero 99: Input Disable	0	
P3.03	Multi-function Input 4 (DI4)		3	
◆ Parameter can be set during RUN Mode.				

Parameter Summary (continued)				
GS1 Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Digital Parameters (continued)				
P3.11	Multi-Function Output Terminal	0: AC Drive Running 1: AC Drive Fault 2: At Speed 3: Zero Speed 4: Above Desired Frequency (P3.16) 5: Below Desired Frequency (P3.16) 6: At Maximum Speed (P0.04) 7: Over torque detected 8: Above Desired Current (P3.17) 9: Below Desired Current (P3.17)	0	
◆ **P3.16**	Desired Frequency	0.0 to 400Hz	0.0	
◆ **P3.17**	Desired Current	0.0 to Drive Rated Amps	0.0	
Analog Parameters				
P4.00	Source of Frequency Command	0: Frequency determined by keypad potentiometer 1: Frequency determined by digital keypad up/down 2: Frequency determined by 0 to +10V input on AI terminal (switch set to "V") 3: Frequency determined by 4 to 20mA input on AI terminal (switch set to "I") 4: Frequency determined by 0 to 20mA input on AI terminal (switch set to "I") 5: Frequency determined by RS-485 communication interface	0	
P4.01	Analog Input Offset Polarity	0: No Offset 1: Positive Offset 2: Negative Offset	0	
◆ **P4.02**	Analog Input Offset	0.0 to 100.0%	0.0	
◆ **P4.03**	Analog Input Gain	0.0 to 300.0%	100.0	
P4.04	Analog Input Reverse Motion Enable	0: Forward Motion Only 1: Reverse Motion Enable	0	
P4.05	Loss of ACI Signal (4-20mA)	0: Decelerate to 0Hz 1: Stop immediately and display error code "EF" 2: Continue operation by the last frequency command	0	
Presets Parameters				
◆ **P5.00**	Jog	0.0 to 400Hz	6.0	
◆ **P5.01**	Multi-Speed 1	0.0 to 400Hz	0.0	
◆ **P5.02**	Multi-Speed 2	0.0 to 400Hz	0.0	
◆ **P5.03**	Multi-Speed 3	0.0 to 400Hz	0.0	
◆ Parameter can be set during RUN Mode.				

Parameter Summary (continued)				
GS1 Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Protection Parameters				
P6.00	Electronic Thermal Overload Relay	0: Constant Torque (inverter/vector duty motors) 1: Variable Torque (fan cooled standard motors) 2: Inactive	0	
P6.01	**Auto Restart after Fault**	0 to 10	0	
P6.02	**Momentary Power Loss**	0: Stop operation after momentary power loss 1: Continue operation after momentary power loss, speed search from Speed Reference 2: Continue operation after momentary power loss, speed search from Minimum Speed	0	
P6.03	Reverse Operation Inhibit	0: Enable Reverse Operation 1: Disable Reverse Operation	0	
P6.04	Auto Voltage Regulation	0: AVR enabled 1: AVR disabled 2: AVR disabled during decel 3: AVR disabled during stop	0	
P6.05	Over-Voltage Trip Prevention	0: Enable Over-voltage Trip Prevention 1: Disable Over-voltage Trip Prevention	0	
P6.06	Auto Adjustable Accel/Decel	0: Linear Accel/Decel 1: Auto Accel, Linear Decel 2: Linear Accel, Auto Decel 3: Auto Accel/Decel 4: Auto Accel/Decel Stall Prevention (limited by P1-01, P1-02, P1-05 and P1-06)	0	
P6.07	Over-Torque Detection Mode	0: Disabled 1: Enabled during constant speed operation 2: Enabled during acceleration	0	
P6.08	Over-Torque Detection Level	30 to 200%	150	
P6.09	Over-Torque Detection Time	0.1 to 10.0	0.1	
P6.10	Over-Current Stall Prevention during Acceleration	20 to 200%	130	
P6.11	Over-Current Stall Prevention during Operation	20 to 200%	130	
P6.12	Maximum Allowable Power Loss Time	0.3 to 5.0 sec	2.0	
P6.13	Base-Block Time for Speed Search	0.3 to 5.0 sec	0.5	
P6.14	Maximum Speed Search Current Level	30 to 200%	150	
P6.15	Upper Bound of Output Frequency	0.1 to 400.0Hz	400.0	
P6.16	Lower Bound of Output Frequency	0.0 to 400.0Hz	0.0	

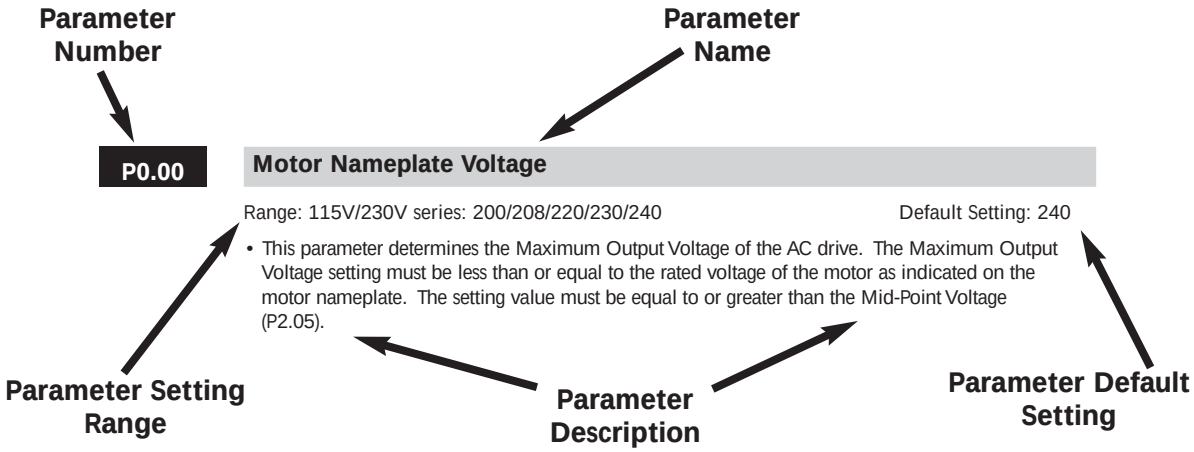
Parameter Summary (continued)				
GS1 Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Protection Parameters (continued)				
P6.30 *	**Line Start Lockout**	00: Enable Line Start Lockout 01: Disable Line Start Lockout	00	
P6.31	Present Fault Record	0: No Fault occurred 1: Over-current (oc) 2: Over-voltage (ov) 3: Overheat (oH) 4: Overload (oL) 5: Overload 1 (oL1) 6: Overload 2 (oL2) 7: External Fault (EF) 8: CPU failure 1 (CF1) 9: CPU failure 2 (CF2) 10: CPU failure 3 (CF3) 11: Hardware Protection Failure (HPF) 12: Over-current during accel (OCA) 13: Over-current during decel (OCd) 14: Over-current during steady state (OCn) 18: External Base-Block (bb) 19: Auto Adjust accel/decel failure (cFA) 20: Software protection code (codE)	00	
P6.32	Second Most Recent Fault Record		00	
P6.33	Third Most Recent Fault Record		00	
P6.34	Fourth Most Recent Fault Record		00	
P6.35	Fifth Most Recent Fault Record		00	
P6.36	Sixth Most Recent Fault Record		00	
***** This parameter is available only with AC drive firmware v1.07 or higher.				

Display Parameters				
◆ **P8.00**	User Defined Display Function	0: Output Frequency (Hz) 1: Motor Speed (RPM) 2: Output Freq. X 8-01 3: Output Current (A) 4: Motor Output Current (%) 5: Output Voltage (V) 6: DC Bus Voltage (V) 9: Frequency Setpoint	0	
◆ **P8.01**	Frequency Scale Factor	0.1 to 160.0	1.0	
◆ Parameter can be set during RUN Mode.				

Parameter Summary (continued)				
GS1 Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Communications Parameters				
P9.00	Communication Address	1 to 254	1	
P9.01	Transmission Speed	0: 4800 baud 1: 9600 baud 2: 19200 baud	1	
P9.02	Communication Protocol	0: MODBUS ASCII mode, 7 data bits, no parity, 2 stop bits 1: MODBUS ASCII mode, 7 data bits, even parity, 1 stop bit 2: MODBUS ASCII mode, 7 data bits, odd parity, 1 stop bit 3: MODBUS RTU mode, 8 data bits, no parity, 2 stop bits 4: MODBUS RTU mode, 8 data bits, even parity, 1 stop bit 5: MODBUS RTU mode, 8 data bits, odd parity, 1 stop bit	0	
P9.03	Transmission Fault Treatment	0: Display fault and continue operating 1: Display fault and RAMP to stop 2: Display fault and COAST to stop 3: No fault displayed and continue operating	0	
P9.04	Time Out Detection	0: Disable 1: Enable	0	
P9.05	Time Out Duration	0.1 to 60.0 seconds	0.5	
◆ **P9.07**	Parameter Lock	0: All parameters can be set and read 1: All parameters are read-only	0	
P9.08	**Restore to Default**	99: Restores all parameters to factory defaults	0	
◆ **P9.11**	Block Transfer Parameter 1	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.12**	Block Transfer Parameter 2	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.13**	Block Transfer Parameter 3	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.14**	Block Transfer Parameter 4	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.15**	Block Transfer Parameter 5	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.16**	Block Transfer Parameter 6	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.17**	Block Transfer Parameter 7	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.18**	Block Transfer Parameter 8	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.19**	Block Transfer Parameter 9	Parameters 0.00 to 8.01, 9.99	9.99	
◆ **P9.20**	Block Transfer Parameter 10	Parameters 0.00 to 8.01, 9.99	9.99	
◆ Parameter can be set during RUN Mode.				

Parameter Summary (continued)				
GS1 Parameter	**Description**	**Range**	**Default Setting**	**User Setting**
Communications Parameters (continued)				
◆ **P9.26**	Serial Comm Speed Reference	0.0 to 400.0 Hz	60.0	
◆ **P9.27**	Serial Comm RUN Command	0: Stop 1: Run	0	
◆ **P9.28**	Serial Comm Direction Command	0: Forward 1: Reverse	0	
◆ **P9.29**	Serial Comm External Fault	0: No fault 1: External fault	0	
◆ **P9.30**	Serial Comm Fault Reset	0: No action 1: Fault Reset	0	
◆ **P9.31**	Serial Comm JOG Command	0: Stop 1: Jog	0	
P9.39 *	Firmware Version	#.##	#.##	
P9.41	GS Series Number	1: GS1 2: GS2 3: GS3 4: GS4	##	
P9.42	Manufacturer Model Information	0: GS1-10P2 (120V, 1ph, 0.25HP) 1: GS1-10P5 (120V, 1ph, 0.5HP) 2: GS1-20P2 (230V, 1ph/3ph, 0.25HP) 3: GS1-20P5 (230V, 1ph/3ph, 0.5HP 4: GS1-21P0 (230V, 1ph/3ph, 1HP) 5: GS1-22P0 (230V, 3ph, 2HP)	##	
* This parameter is available only with AC drive firmware v1.07 or higher.				
◆ Parameter can be set during RUN Mode.				

Detailed Parameter Listings


Parameter Number
Parameter Name
P0.00
Motor Nameplate Voltage
Range: 115V/230V series: 200/208/220/230/240
Default Setting: 240
• This parameter determines the Maximum Output Voltage of the AC drive. The Maximum Output Voltage setting must be less than or equal to the rated voltage of the motor as indicated on the motor nameplate. The setting value must be equal to or greater than the Mid-Point Voltage (P2.05).
Parameter Setting Range
Parameter Description
Parameter Default Setting

If the ◆ symbol is found next to the parameter name, the parameter can be edited when the AC drive is in RUN Mode.

Motor Parameters

P0.00 Motor Nameplate Voltage

Range: 115/230V series: 200/208/220/230/240 Default Setting: 240

- This parameter determines the Maximum Output Voltage of the AC drive. The Maximum Output Voltage setting must be less than or equal to the rated voltage of the motor as indicated on the motor nameplate. The setting value must be equal to or greater than the Mid-Point Voltage (P2.05).

P0.01 Motor Nameplate Amps

Range: Drive Rated Amps x 0.3 to Drive Rated Amps x 1.0 Default Setting: Drive Rating (A)

- This parameter sets the output current to the motor. The value is determined by the value found on the motor nameplate.

P0.02 Motor Base Frequency

Range: 50/60/400 Default Setting: 60

- This value should be set according to the base frequency of the motor as indicated on the motor nameplate. It sets the Maximum Voltage Frequency and determines the volts per hertz ratio.

P0.03 Motor Base RPM

Range: 375 to 9999 RPM Default Setting: 1750

- This value should be set according to rated Base RPM of the motor as indicated on the motor nameplate.

P0.04 Motor Maximum RPM

Range: P0-03 to 9999 RPM Default Setting: P0-03

- This value should be set according to the desired maximum speed of the motor.

WARNING: **The Motor Maximum RPM parameter (P0.04) should never exceed the maximum safe RPM rating for the motor you are using. If this information is not readily available, consult your motor manufacturer.**

- This value cannot be set lower than Motor Base RPM (P0.03).

This parameter, along with P 0.02 and P 0.03, determines the Maximum Output Frequency of the AC Drive. The Maximum Output Frequency is can be calculated as follows:

$$\textbf{Max. Output Frequency} = \left(\frac{\text{Motor Max. RPM (P0.04)}}{\text{Motor Base RPM (P0.03)}}\right) \text{x Base Frequency (P0.02)}$$

If an output limit based on Maximum Output Frequency is desired, use the following equation to determine the corresponding value for Motor Maximum RPM:

$$\textbf{Motor Maximum RPM} = \left(\frac{\text{Max. Output Frequency}}{\text{Motor Base Frequency (P0.02)}}\right) \text{x Motor Base RPM (P0.03)}$$

Ramp Parameters

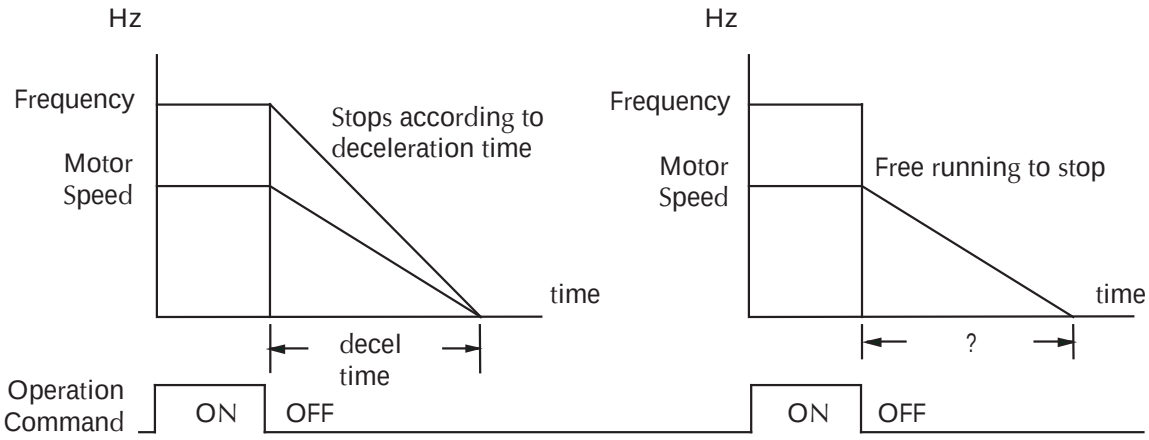
P1.00 Stop Methods

Range: 0 Ramp to Stop
1 Coast to stop

Default Setting: 0

- This parameter determines how the motor is stopped when the AC drive receives a valid stop command.
- Ramp: The AC drive decelerates the motor to Minimum Output Frequency (P2.06) according to the deceleration time set in P1.02 or P1.06.
- Coast: The AC drive stops output instantly upon command, and the motor free runs until it comes to a complete stop.

The drive application or system requirements will determine which stop method is needed.



Ramp **Coast**

P1.01 ◆ Acceleration Time 1

Range: 0.1 to 600.0 sec

Default Setting: 10 sec

- This parameter is used to determine the rate of acceleration for the AC drive to reach Maximum Motor RPM (P0.04). The rate is linear unless S-Curve is "Enabled."

P1.02 ◆ Deceleration Time 1

Range: 0.1 to 600.0 sec Default Setting: 30.0 sec

- This parameter is used to determine the time required for the AC drive to decelerate from the Maximum Motor RPM (P0.04) down to 0Hz. The rate is linear unless S-Curve is "Enabled."

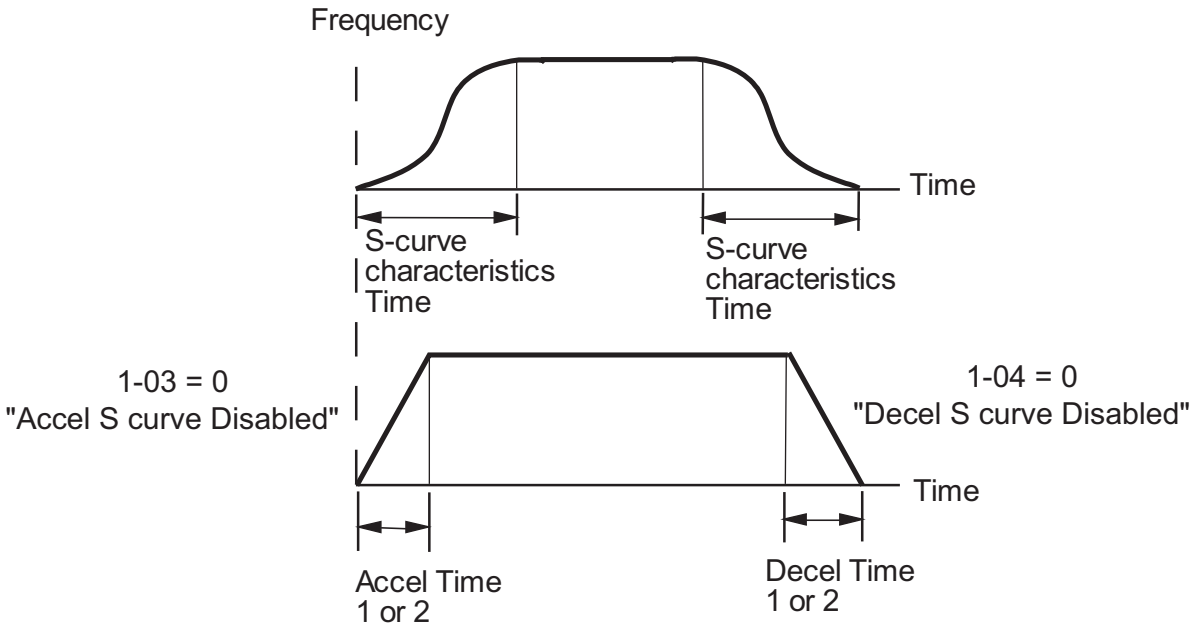
Bus over-voltage trips may be caused by motor regeneration during rapid deceleration. If this tripping occurs, increase the deceleration time.

P1.03 Accel S-Curve

Range: 0 to 7 Default Setting: 0

- This parameter is used whenever the motor and load need to be accelerated more smoothly. The Accel S-Curve may be set from 0 to 7 to select the desired acceleration S Curve.

From the diagram shown below, the original setting accel/decel time will be for reference when the function of the S-curve is enabled. The actual accel/decel time will be determined based on the S-curve selected (1 to 7).

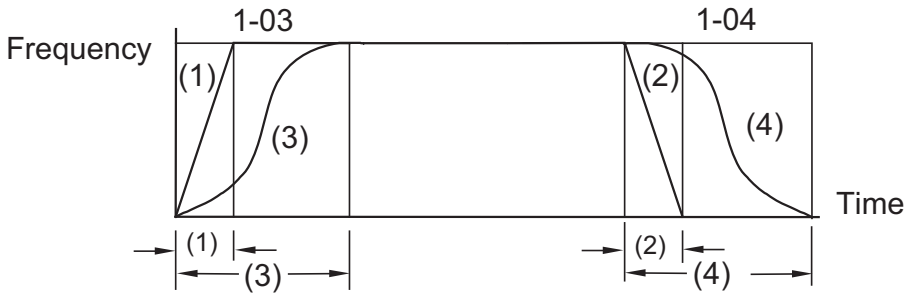


P1.04 Decel S-Curve

Range: 0 to 07 Default Setting: 0

- This parameter is used whenever the motor and load need to be decelerated more smoothly. The Decel S-Curve may be set from 0 to 7 to select the desired deceleration S-Curve.

From the diagram shown below, the original setting accel/decel time will be for reference when the function of the S-curve is enabled. The actual accel/decel time will be determined based on the S-curve selected (1 to 7).



S curve is disabled in (1), (2)
1-03 sets S curve for (3)
1-04 sets S curve for (4)

P1.05 ◆ Acceleration Time 2

Range: 0.1 to 600.0 sec Default Setting: 10.0

- The Second Acceleration Time determines the time for the AC drive to accelerate from 0 RPM to Maximum Motor RPM (P0.04). Acceleration Time 2 (P1.05) can be selected using a multi-function input terminal or frequency transition (P1.07).

P1.06 ◆ Deceleration Time 2

Range: 0.1 to 600.0 sec Default Setting: 30 sec

- The Second Deceleration Time determines the time for the AC drive to decelerate from Maximum Motor RPM (P0.04) to 0 RPM. Deceleration Time 2 (P1.06) can be selected using a multi-function input terminal or frequency transition (P1.07).

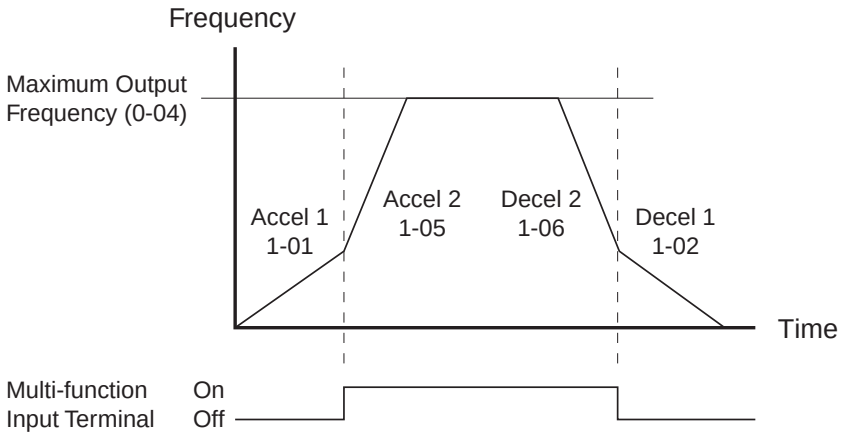
P1.07 Select method for 2nd Accel/Decel

Range: 0: Second Accel/Decel from terminal
1: Frequency Transition
P1.08 & P1.09

Default Setting: 0

- The second set of acceleration and deceleration times P1.05 and P1.06 can be selected either with a multi-function input terminal programmed to Second Accel/Decel or by the values of the transition frequencies P1.08 and P1.09

Second Accel/Decel Times selected with Multi-Function Input Terminal

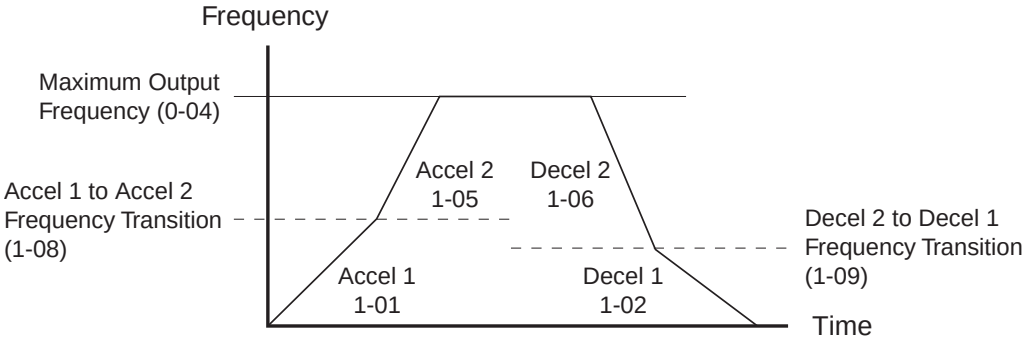


P1.08 Accel 1 to Accel 2 Frequency Transition

Range: 0.0 to 400.0 Hz

Default Setting: 0.0

Second Accel/Decel Times selected with Frequency Transition



P1.09 Decel 1 to Decel 2 Frequency Transition

Range: 0.0 to 400.0 Hz

Default Setting: 0.0

Refer to the P1.08 diagram.

P1.10 Skip Frequency 1

Range: 0.0 to 400.0Hz Default Setting: 0.0

P1.11 Skip Frequency 2

Range: 0.0 to 400.0Hz Default Setting: 0.0

P1.12 Skip Frequency 3

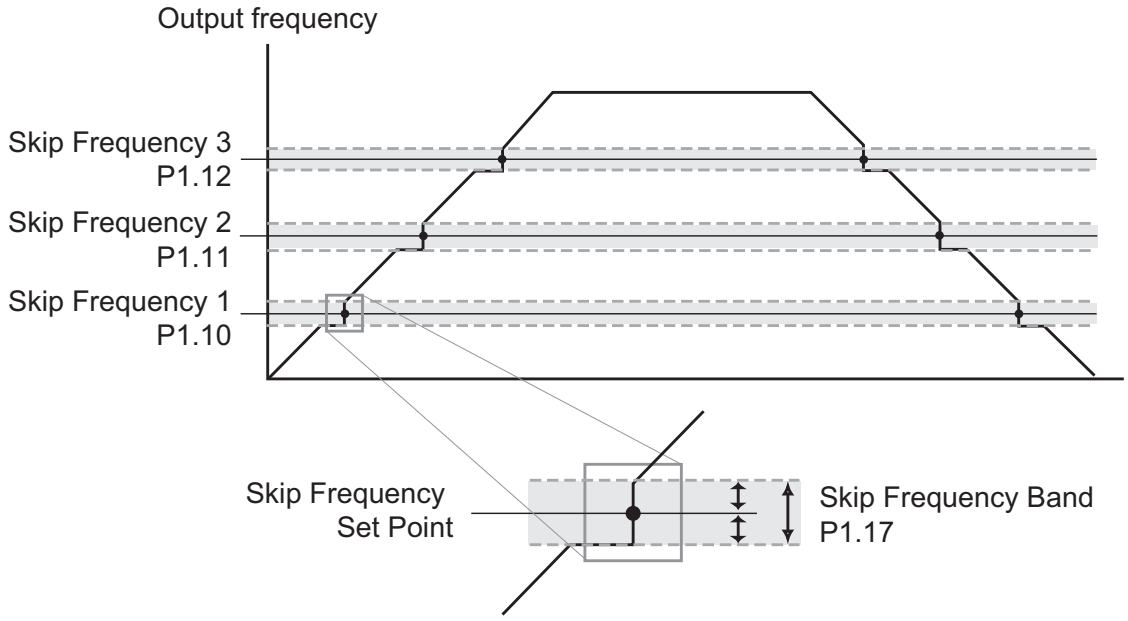
Range: 0.0 to 400.0 Hz Default Setting: 0.0

- P1.10, P1.11, and P1.12 determine the location of the frequency bands that will be skipped during AC drive operation.

P1.17 Skip Frequency Band

Range: 0.0 to 20.0 Hz Default Setting: 0.0

- This parameter determines the frequency band for a given Skip Frequency (P1.10, P1.11, or P1.12). Half of the Skip Frequency Band is above the Skip Frequency and the other half is below. Programming this parameter to 0.0 disables all skip frequencies.



P1.19 DC Injection Voltage Level

Range: 0 to 30% Default Setting: 0

- This parameter determines the amount of DC Braking Voltage applied to the motor during start-up and stopping. When setting DC Braking Voltage, please note that the setting is a percentage of the rated voltage of the drive. It is recommended to start with a low DC Braking Voltage Level and then increase until proper holding torque has been attained.

P1.20 DC Injection during Start-up

Range: 0.0 to 5.0 sec Default Setting: 0.0

- This parameter determines the duration of time that the DC Braking Voltage will be applied to the motor during the AC drive start-up. DC Braking will be applied for the time set in this parameter until the Minimum Frequency is reached during acceleration.

P1.21 DC Injection during Stopping

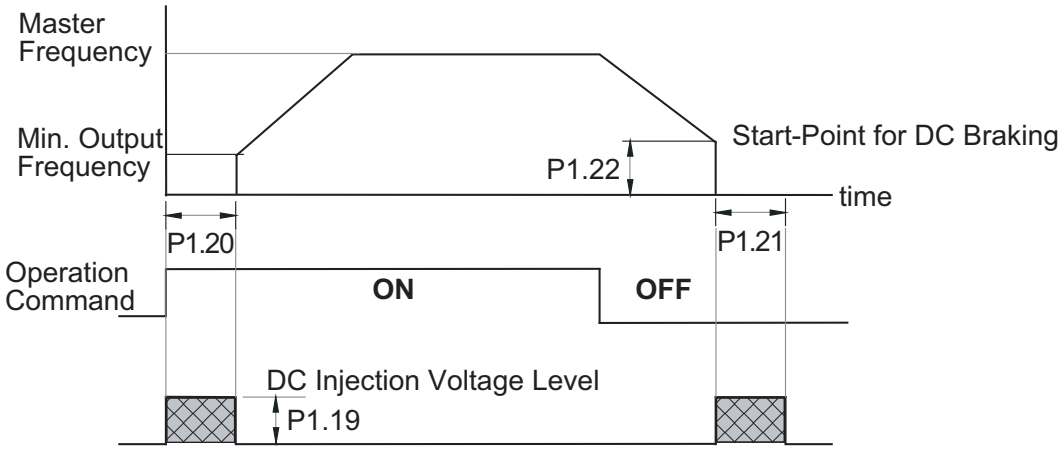
Range: 0.0 to 25.0 sec Default Setting: 0.0

- This parameter determines the duration of time that the DC braking voltage will be applied to the motor during stopping. If stopping with DC Braking is desired, then P1.00 must be set to Ramp to Stop (00).

P1.22 Start-point for DC Injection

Range: 0.0 to 60.0 Hz Default Setting: 0.0

- This parameter determines the frequency when DC Braking will begin during deceleration.



Volts/Hertz Parameters

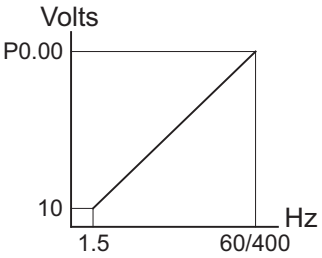
P2.00 Volts/Hertz Settings

Range: 0 - General Purpose (constant torque)
1 - High Starting Torque
2 - Fans and Pumps (variable torque)
3 - Custom

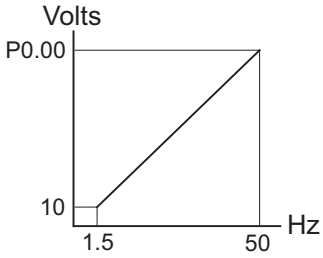
Default Setting: 0

P2.04 through P2.07 are only used when the Volts/Hertz parameter (P2.00) is set to 3.

P2.00 = 0: General Purpose (constant torque)

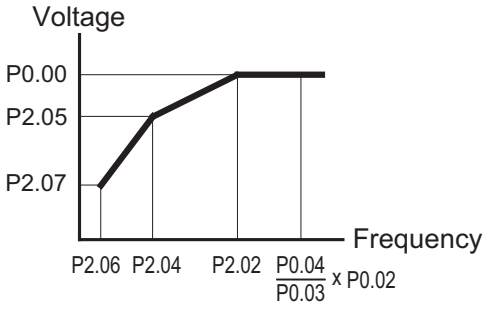


60/400Hz Base Frequency

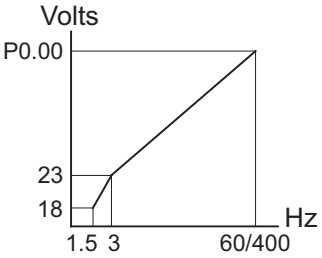


50Hz Base Frequency

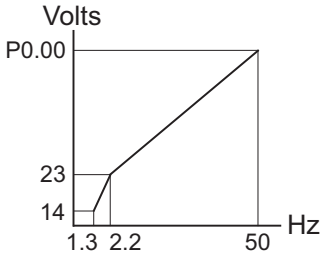
P2.00 = 3: Custom



P2.00 = 1: High Starting Torque

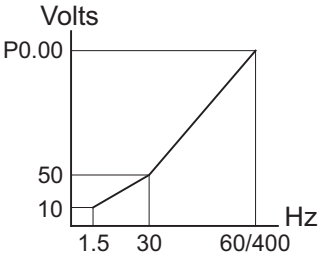


60/400Hz Base Frequency

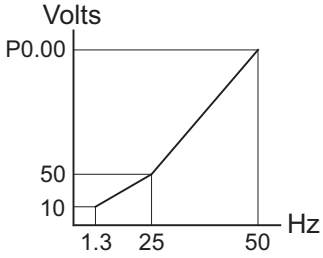


50Hz Base Frequency

P2.00 = 2: Fans and Pumps (variable torque)



60/400Hz Base Frequency



50Hz Base Frequency

P2.01 ◆ Slip Compensation

Range: 0.0 to 10.0 Default Setting: 0.0

- When controlling an asynchronous induction motor, an increase in load on the motor will result in an increase in slip within the motor. This parameter may be used to compensate the nominal slip within a range of 0 to 10. When the output current of the AC drive is greater than 40% of the Motor Nameplate Amps (P0.01), the AC drive will adjust its output frequency according to this parameter.

P2.03 ◆ Manual Torque Boost

Range: 0 to 10% Default Setting: 1

- This parameter provides a gain that increases the output voltage command to enhance output torque.

P2.04 through P2.07 are used only when the Volts/Hertz parameter (P2.00) is set to 3.

P2.04 Mid-point Frequency

Range: 1.0 to 400 Hz Default Setting: 1.5

- This parameter sets the Mid-Point Frequency of V/F curve. With this setting, the V/F ratio between Minimum Frequency and Mid-Point frequency can be determined.
- **This parameter must be greater than or equal to the Minimum Output Frequency (P2.06) and less than or equal to the Maximum Voltage Frequency (P0.02).**

P2.05 Mid-point Voltage

Range: 2.0 to 255.0V Default Setting: 10.0

- This parameter sets the Mid-Point Voltage of any V/F curve. With this setting, the V/F ratio between Minimum Frequency and Mid-Point Frequency can be determined.
- **This parameter must be equal to or greater than the Minimum Output Voltage (P2.07) and equal to or less than the Maximum Output Voltage (P0.00).**

P2.06 Minimum Output Frequency

Range: 1.0 to 20.0 Hz Default Setting: 1.5

- This parameter sets the Minimum Output Frequency of the AC drive.
- **This parameter must be less than or equal to the Mid-Point Frequency (P2.04).**

P2.07 Minimum Output Voltage

Range: 2.0 to 50.0V Default Setting: 10.0

- This parameter sets the Minimum Output Voltage of the AC drive.
- **This parameter must be equal to or less than Mid-Point Voltage (P2.05).**

P2.08 PWM Carrier Frequency

Range: 3 to 10 kHz Default Setting: 10

- This parameter sets the carrier frequency of PWM (Pulse-Width Modulated) output.
- In the table below, we see that the carrier frequency of PWM output has a significant influence on the electromagnetic noise, leakage current, heat dissipation of the AC drive and the acoustic noise to the motor.

Carrier Frequency	Acoustic Noise	Electromagnetic Noise, Leakage Current	Heat Dissipation
3kHz	significant	minimal	minimal
10kHz	minimal	moderate	moderate

Digital Parameters

P3.00 Source of Operation Command

Default Setting: 0

Settings	0	Operation Determined by Digital Keypad
	1	Operation determined by external control terminals. Keypad STOP is enabled.
	2	Operation determined by external control terminals. Keypad STOP is disabled.
	3	Operation determined by RS-485 interface. Keypad STOP is enabled.
	4	Operation determined by RS-485 interface. Keypad STOP is disabled.

- This parameter sets the input source for the AC drive operation commands.
- Refer to P3.01 and P3.03 for more details.

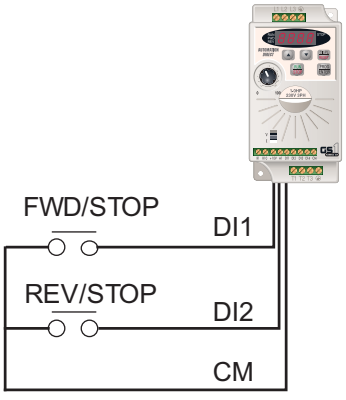
P3.01 Multi-function Inputs 1 & 2(DI1-DI2)

Default Setting: 0

Settings	0	DI1 - FWD/STOP DI2 - REV/STOP
	1	DI1 - RUN/STOP DI2 - REV/FWD
	2	DI1 - RUN (N.O. latching input) DI2 - REV/FWD DI3 - STOP (N.C. latching input)

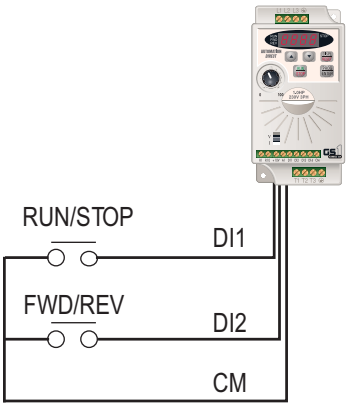
Multi-function Input Terminals DI1 and DI2 do not have separate parameter designations. DI1 and DI2 must be used in conjunction with one another to operate two and three wire control.

P3.01: Setting 0



DI1	DI2	Result
OFF	OFF	STOP
ON	OFF	FWD
OFF	ON	REV
ON	ON	STOP

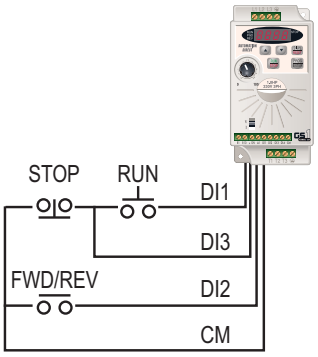
P3.01: Setting 1



DI1- RUN/STOP select
"Open" : Stop
"Close" : Run

DI2- FWD/REV select
"Open" : FWD
"Close" : REV

P3.01: Setting 2



DI1- RUN command
Latching input (N.O.)
Runs when closed

DI2- FWD/REV select
"Open" : FWD
"Close" : REV

DI3- STOP command
Latching input (N.C.)
Stops when open

The external STOP and RUN pushbuttons are momentary.
The circuit latches as does a typical 3-wire control circuit.

P3.02 Multi-Function Input 3 (DI3)

Default Setting: 0

Settings same as for P3.03, except when P3.01 = 2.

P3.02 automatically sets to 99 when P3.01=2.

P3.03 Multi-Function Input 4 (DI4)

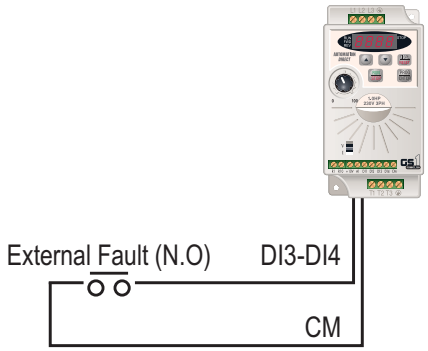
Settings for P3.02 and P3.03 Default Setting: 3

Settings	0	External Fault (N.O.)
	1	External Fault (N.C.)
	2	External Reset
	3	Multi-Speed Bit 1
	4	Multi-Speed Bit 2
	9	Jog
	10	External Base Block (N.O.)
	11	External Base Block (N.C.)
	12	Second Accel/Decel Time
	13	Speed Hold
	14	Increase Speed (P4.00 must be set to 1)
	15	Decrease Speed (P4.00 must be set to 1)
	16	Reset Speed to Zero (P4.00 must be set to 1)
	99	Input Disable

Setting Explanations for Parameters P3.02 and P3.03

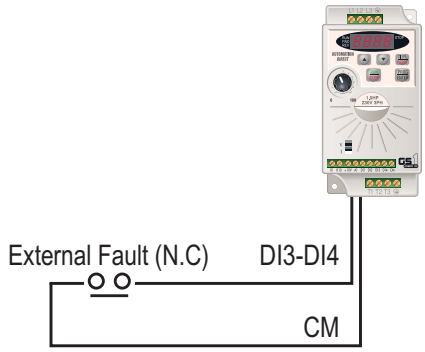
Setting 0: External Fault (N.O.)

When an External Fault input signal is received, the AC drive output will turn off, the drive will display "EF" on the LED Display, and the motor will Coast to Stop. To resume normal operation, the external fault must be cleared, and the drive must be reset.



DI3-DI4: External Fault (N.O.)
"Close": Drive receives external fault input signal

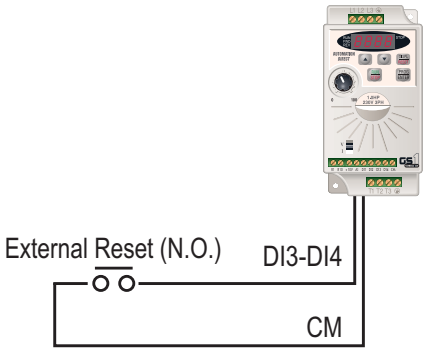
Setting 1: External Fault (N.C.)



DI3-DI4: External Fault (N.C.)
"Open": Drive receives external fault input signal

Setting 2: External Reset

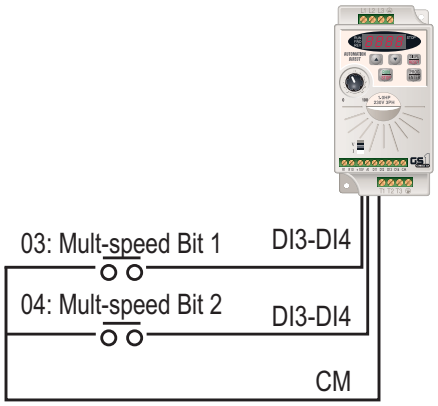
An External Reset has the same function as the Reset key on the digital keypad. Use an External Reset to reset the drive after a fault.



DI3-DI4: External Reset
"Close": Drive receives external reset input signal

Settings 3 and 4: Multi-Speed Bits 1 and 2

The three Multi-Speed Bits are used to select the multi-speed settings defined by parameters P5.01 to P5.03.



Multi-Speed Bits		Speed Selection
Bit 2	Bit 1	
OFF	OFF	4-00: Source of Frequency
OFF	ON	5-01: Multi-Speed 1
ON	OFF	5-02: Multi-Speed 2
ON	ON	5-03: Multi-Speed 3

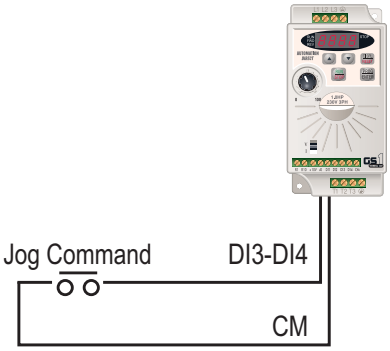
(DI3 or DI4 can be assigned as Multi-Speed Bit 1 or as Multi-Speed Bit 2.)

In order to use the Multi-Speed settings, parameters P5.01 to P5.03 must be set.

When all multi-speed inputs are off, the AC drive reverts back to the Command Frequency (P4.00).

Setting 9: Jog Command

This setting configures a Multi-function Input Terminal to give the Jog Command when activated. P5.00 sets the Jog Speed.

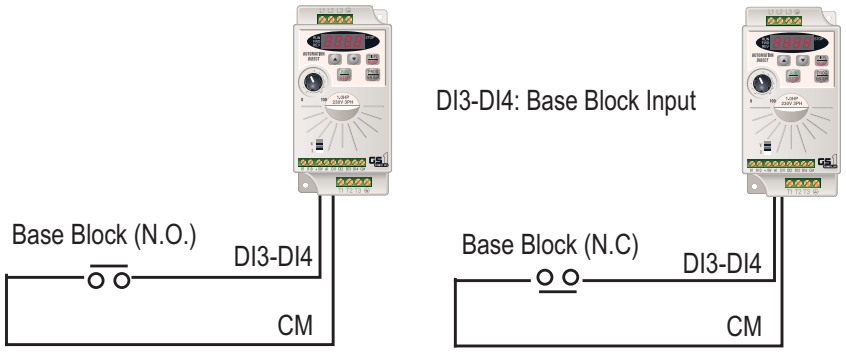


DI3-DI4: Jog Command
"Close": Drive receives Jog Command signal

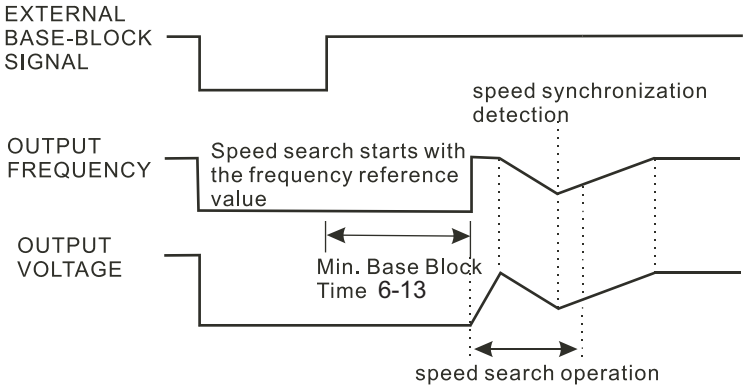
The Jog Command cannot be used when the motor is running.
The motor must be stopped to initiate this command.

Setting 10 and 11: External Base Block (N.O.) and External Base Block (N.C.)

Value 10 is for a normally open (N.O) input and value 11 is for a normally closed (N.C.) input.



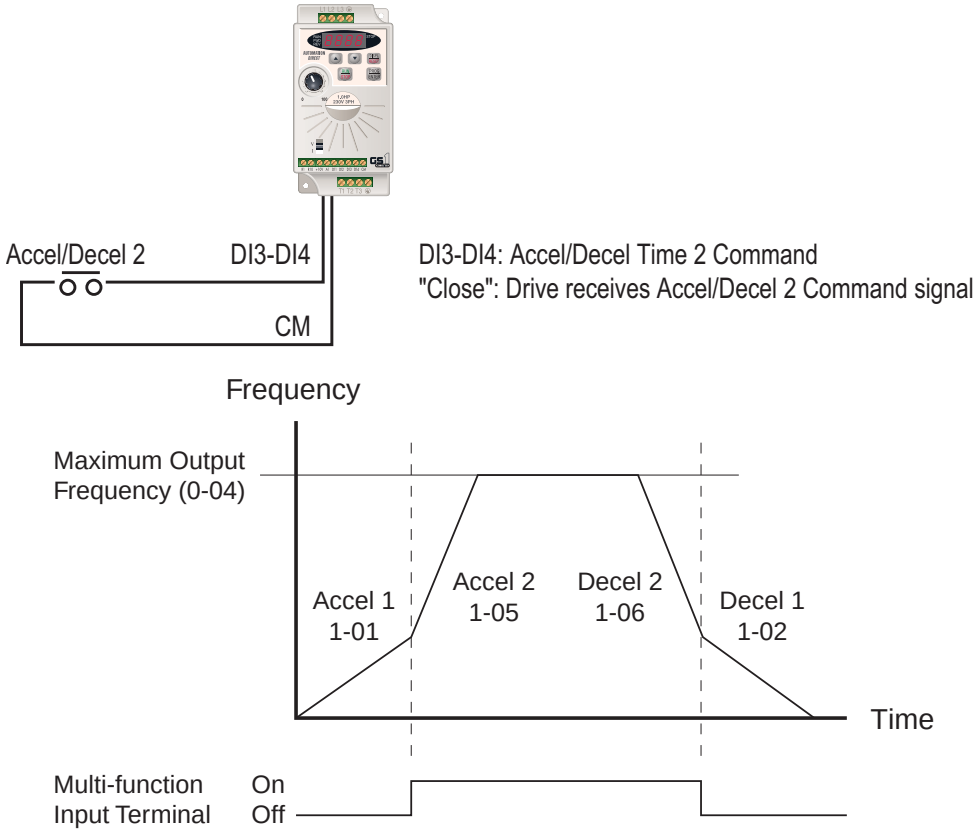
When an External Base Block is activated, the LED display shows bb, the AC drive stops all output, and the motor will free run. When the External Base Block is deactivated, the AC drive will start the speed search function and synchronize with the motor speed. The AC drive will then accelerate to the Master Frequency



Refer also to P6.13 (Base-Block Time for Speed Search) and P6.14 (Maximum Speed Search Current Level).

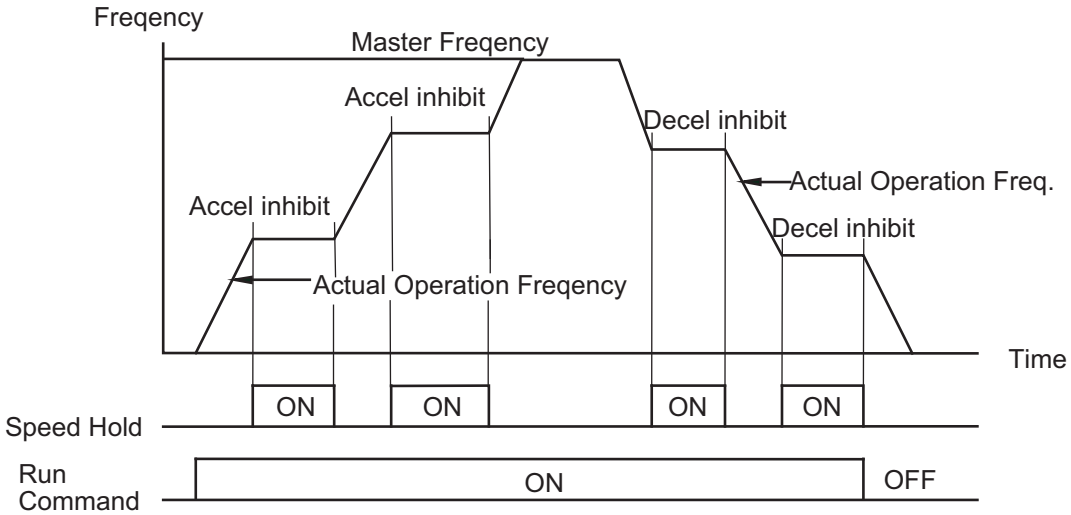
Setting 12: Second Accel/Decel Time

Multi-function Input Terminals DI3 and DI4 can be set to select between Accel/Decel times 1 and 2. Parameters 1.01 and 1.02 set Accel 1 and Decel 1 times. Parameters 1.05 and 1.06 set Accel 2 and Decel 2 times.



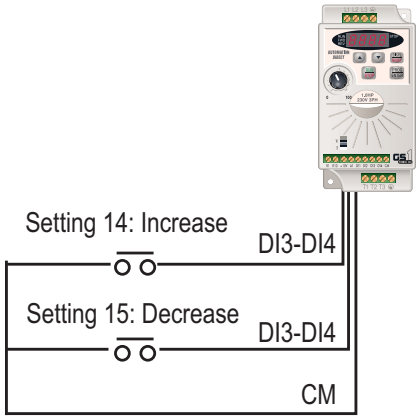
Setting 13: Speed Hold

When the Speed Hold command is received, the drive acceleration or deceleration is stopped and the drive maintains a constant speed.



Settings 14 and 15: Increase and Decrease Speed (Electronic Motor Operated Potentiometer)

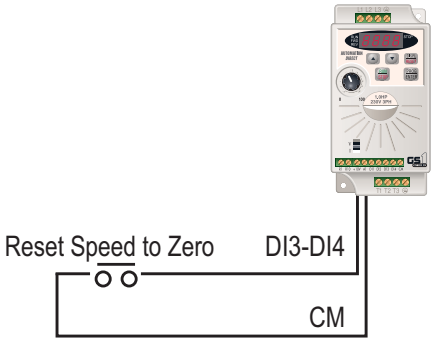
Settings 14 and 15 allow the Multi-function terminals to be used to increase or decrease speed incrementally. Each time an increase/decrease speed input is received the Master Frequency will increase/decrease by one unit.



DI3-DI4: Increase or Decrease Frequency
"Close": Drive receives Increase or Decrease Frequency Input

In order to use these settings, P4.00 must be set to 1.

Setting 16: Reset Speed to Zero



DI3-DI4: Reset Speed to Zero
"Close": Drive receives Reset Speed to Zero signal

Setting 99: Multi-Function Input Disable

Setting a Multi-Function Input to 99 will disable that input. The purpose of this function is to provide isolation for unused Multi-Function Input Terminals. Any unused terminals should be programmed to 99 to make sure they have no effect on drive operation.

Any unused terminals should be programmed to 99 to make sure they have no effect on drive operation.

P3.11 Multi-function Output Terminal

Default Setting: 0

Settings:	0	AC Drive Running
	1	AC Drive Fault
	2	At Speed
	3	Zero Speed
	4	Above Desired Frequency (P3.16)
	5	Below Desired Frequency (P3.16)
	6	At Maximum Speed (P0.04)
	7	Over Torque Detected
	8	Above Desired Current (P3.17)
	9	Below Desired Current (P3.17)

Function Explanations:

Setting 0: AC Drive Running – The terminal will be activated when there is an output from the drive.

Setting 1: AC Drive Fault – The terminal will be activated when one of the faults listed under parameters P6.31 through P6.36 occurs.

Setting 2: At Speed – The terminal will be activated when the AC drive attains the Command Frequency (P4.00).

Setting 3: Zero Speed – The output will be activated when Command Frequency (P4.00) is lower than the Minimum Output Frequency (P2.06).

Setting 4: Above Desired Frequency – The output will be activated when the AC drive is above the Desired Frequency (P3.16).

Setting 5: Below Desired Frequency – The output will be activated when the AC drive is below the Desired Frequency (P3.16).

Setting 6: At Maximum Speed – The output will be activated when the AC drive reaches Motor Maximum RPM (P0.04).

Setting 7: Over Torque Detected – The output will be activated when the AC drive reaches the Over-torque Detection Level (P6.08) and exceeds this level for a time greater than the Over-torque Detection Time (P6.09).

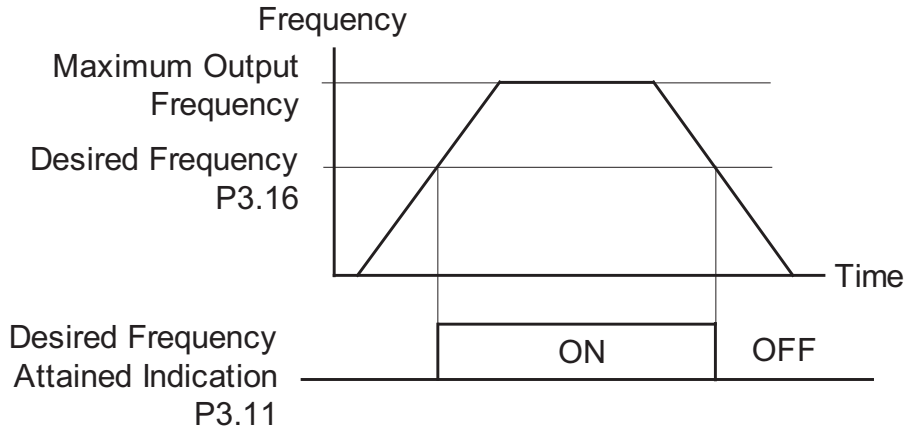
Setting 8: Above Desired Current – The output will be activated when the AC drive is above the Desired Current (P3.17).

Setting 9: Below Desired Current – The output will be activated when the AC drive is below the Desired Current (P3.17).

P3.16 ◆ Desired Frequency

Range: 0.0 to 400.0Hz Default Setting: 0.0

- If the Multi-function output terminal is set to function as Desired Frequency Attained (P3.11 = 04 or 05), then the output will be activated when the programmed frequency is attained.

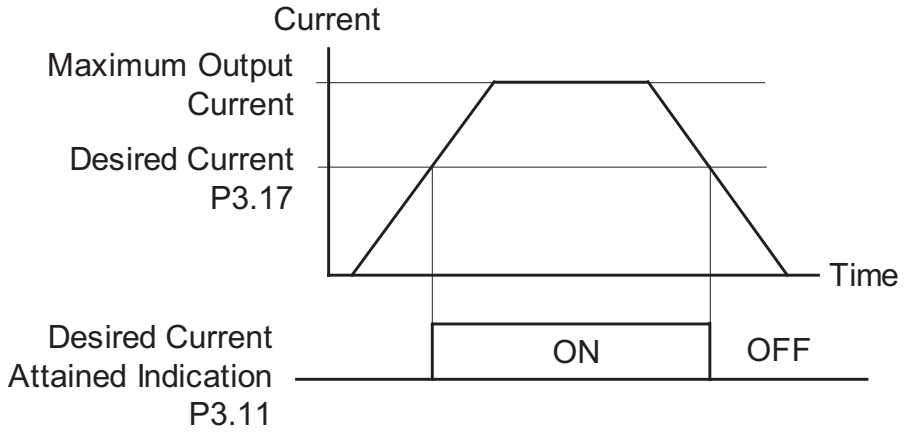


Max. Output Frequency = $\left(\frac{\text{Motor Max. RPM (P0.04)}}{\text{Motor Base RPM (P0.03)}}\right)$ x Base Frequency (P0.02)

P3.17 ◆ Desired Current

Range: 0.0 to <Drive Rated Amps> Default Setting: 0.0

- If the Multi-function output terminal is set to function as Desired Current Attained (P3.11 = 08 or 09), then the output will be activated when the programmed current is attained.



Analog Parameters

P4.00 Source of Frequency Command

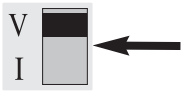
Default: 0

Settings:

0 Frequency determined by keypad potentiometer.

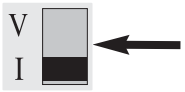
1 Frequency determined by digital keypad up/down.

2 Frequency determined by 0 to +10V input on AI terminal. Analog input switch must be set to "V".



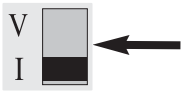
AI switch must be set to "V" in order to use a 0 to +10V input.

3 Frequency determined by 4 to 20mA input on AI terminal. Analog input switch must be set to "I".



AI switch must be set to "I" in order to use a 4 to 20mA input.

4 Frequency determined by 0 to 20mA input on AI terminal. Analog input switch must be set to "I".



AI switch must be set to "I" in order to use a 0 to 20mA input.

5 Frequency determined by RS-485 communication interface.

P4.01 to P4.04 are used when the source of frequency command is the analog signal (0 to +10VDC, 4 to 20mA, or 0 to 20mA).
*Refer to the **Analog Input Examples** later in this section.*

P4.01 Analog Input Offset Polarity

Range: 0 Offset disabled
1 Positive Offset
2 Negative Offset

Default Setting: 0

- This parameter sets the potentiometer Bias Frequency to be positive or negative.
- The Analog Input Offset calculation will also define the Offset Polarity. See the note after P4.02.
- P4.01 to P4.04 are used when the source of frequency command is the analog signal (0 to +10VDC, 4 to 20mA, or 0 to 20mA).

P 4.02 ◆ Analog Input Offset

Range: 0.0 to 100% Default Setting: 0.0

This parameter can be set during the operation.

- This parameter provides a frequency offset for an analog input.
- Use the equation below to determine the Analog Input Offset. For this equation, you will need to know the necessary Minimum and Maximum Frequency References needed for your application.

$$\text{Analog Offset \%} = \left(\frac{\text{Min. Frequency Reference}}{\text{Max. Frequency Reference}} \right) \times 100$$

The result of the Analog Input Offset calculation will also define the Analog Input Offset Polarity (P4.01). A positive answer means you should have a positive offset. A negative answer means you should have a negative offset.

- P4.01 to P4.04 are used when the source of frequency command is the analog signal (0 to +10VDC, 4 to 20mA, or 0 to 20mA).

P4.03 ◆ Analog Input Gain

Range: 0.0 to 300.0% Default Setting: 100.0

This parameter can be set during the operation.

- This parameter sets the ratio of analog input vs frequency output.
- Use the equation below to calculate the Analog Input Gain. For this equation, you will need to know the minimum and maximum set-point frequencies needed for your application.

$$\text{Analog Gain \%} = \left(\frac{\text{Max. Frequency Reference} - \text{Min. Frequency Reference}}{\text{Maximum Output Frequency}} \right) \times 100$$

- P4.01 to P4.04 are used when the source of frequency command is the analog signal (0 to +10VDC, 4 to 20mA, or 0 to 20mA).

P4.04 Analog Input Reverse Motion Enable

Range: 0 Forward Motion Only Default Setting: 0
1 Reverse Motion Enable

- P4.01 to P4.04 are used when the source of frequency command is the analog signal (0 to +10VDC, 4 to 20mA, or 0 to 20mA).

P4.05 Loss of ACI Signal (4–20mA)

Range: 0 - Decelerate to 0Hz Default Setting: 0
1 – Stop immediately and display “EF”.
2 – Continue operation by the last frequency command

- This parameter determines the operation of the drive when the ACI frequency command is lost.

Analog Input Examples

Use the equations below when calculating the values for the Maximum Output Frequency, Analog Input Offset, Analog Input Gain, and the Mid-point Frequency.

A) **Max. Output Frequency =** $\left(\frac{\text{Motor Max. RPM (P0.04)}}{\text{Motor Base RPM (P0.03)}}\right)$ x Base Frequency (P0.02)

The Maximum Output Frequency is not a parameter setting, but is needed in order to calculate the Analog Gain. The default Maximum Output Frequency for the GS1 drive is 60 Hz. If parameters P0.02, P0.03, or P0.04 are changed, then the Maximum Output Frequency will change.

B) **Analog Offset % =** $\left(\frac{\text{Min. Frequency Reference}}{\text{Max. Frequency Reference}}\right)$ x 100

C) **Analog Gain % =** $\left(\frac{\text{Max. Frequency Reference} - \text{Min. Frequency Reference}}{\text{Maximum Output Frequency}}\right)$ x 100

D) **Mid-point Freq. =** $\left(\frac{\text{Max. Freq. Reference} - \text{Min. Freq. Reference}}{2}\right)$ + Min. Freq. Reference

The Mid-point Frequency calculation shows the frequency reference of the drive when the potentiometer or other analog device is at its mid-point.

Example 1: Standard Operation

This example illustrates the default operation of the drive. The example is given to further illustrate the use of the analog calculations. The full range of the analog input signal corresponds to the full forward frequency range of the AC drive.

- Minimum Frequency Reference = 0Hz
- Maximum Frequency Reference = 60 Hz

Calculations

A) **Max. Output Frequency =** $\left(\frac{1750\ \text{rpm}}{1750\ \text{rpm}}\right) \times 60\text{Hz} = 60\text{Hz}$

B) **Analog Offset % =** $\left(\frac{0\text{Hz}}{60\text{Hz}}\right) \times 100 = 0\%$

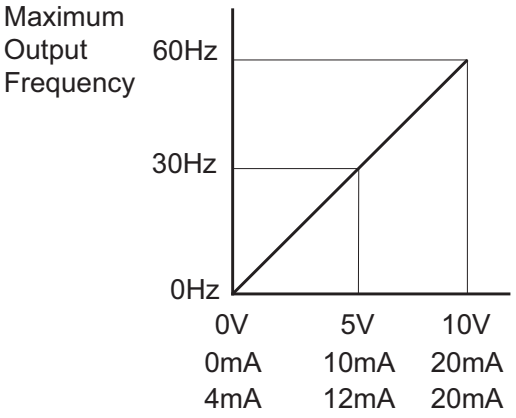
C) **Analog Gain % =** $\left(\frac{60\text{Hz} - 0\text{Hz}}{60\text{Hz}}\right) \times 100 = 100\%$

D) **Mid-point Frequency =** $\left(\frac{60\text{Hz} - 0\text{Hz}}{2}\right) + 0\text{Hz} = 30\text{Hz}$

Parameter Settings

P4.01: 00 (default) – Offset disabled
P4.02: 00 (default) – 0% Analog Input Offset
P4.03: 100 (default) – 100% Analog Input Gain
P4.04: 00 (default) – Forward Motion Only

Results



Example 2: Standard Operation with Increased Maximum Output Frequency

This example illustrates how to run the motor faster than its base speed. For this purpose, the only required parameter change is P0.04, Motor Maximum RPM. (Motors produce reduced output torque when running above their base speed.)

WARNING: The Motor Maximum RPM parameter (P0.04) should never exceed the maximum speed rating for the motor you are using. If this information is not readily available, consult your motor manufacturer.

The analog input adjustment parameters P4.01 through P4.04 can remain defaulted, as determined by the analog input calculations shown below. The increased Maximum Output Frequency can be obtained regardless of whether the Source of Frequency Command is an analog input or one of the other sources, such as the keypad, RS-485 communication interface, jog, or multi-speed settings.

- Minimum Frequency Reference = 0Hz
- Maximum Frequency Reference = 70 Hz
- Motor Maximum RPM = 2042 rpm

Calculations

A) **Max. Output Frequency =** $\left(\frac{2042\ \text{RPM}}{1750\ \text{RPM}}\right) \times 60\text{Hz} = 70\text{Hz}$

B) **Analog Offset % =** $\left(\frac{0\text{Hz}}{70\text{Hz}}\right) \times 100 = 0\%$

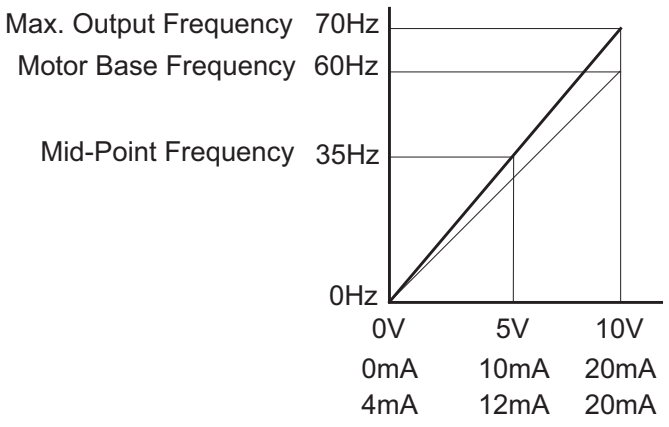
C) **Analog Gain % =** $\left(\frac{70\text{Hz} - 0\text{Hz}}{70\text{Hz}}\right) \times 100 = 100\%$

D) **Mid-point Frequency =** $\left(\frac{70\text{Hz} - 0\text{Hz}}{2}\right) + 0\text{Hz} = 35\text{Hz}$

Parameter Settings

P0.04: 2042 – Motor Maximum RPM
P4.01: 00 (default) – Offset disabled
P4.02: 00 (default) – 0% Analog Input Offset
P4.03: 100 (default) – 100% Analog Input Gain
P4.04: 00 (default) – Forward Motion Only

Results



Example 3: Positive Offset

In this example, the Analog Input will have a positive offset while still using the full scale of the potentiometer or other analog signal device. When the analog signal is at its lowest value (0V, 0mA, or 4mA), the set-point frequency will be at 10Hz. When analog signal is at its maximum value (10V or 20mA), the set-point frequency will be 60 Hz.

- Minimum Frequency Reference = 10 Hz
- Maximum Frequency Reference = 60 Hz

Calculations

A) **Max. Output Frequency =** $\left(\frac{1750\ \text{rpm}}{1750\ \text{rpm}}\right) \times 60\text{Hz} = 60\text{Hz}$

B) **Analog Offset % =** $\left(\frac{10\text{Hz}}{60\text{Hz}}\right) \times 100 = 16.7\%$

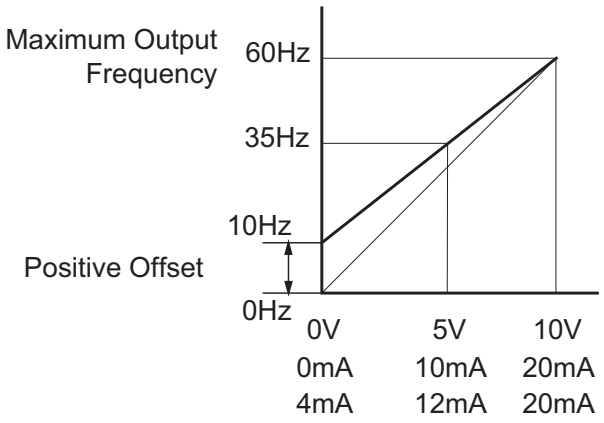
C) **Analog Gain % =** $\left(\frac{60\text{Hz} - 10\text{Hz}}{60\text{Hz}}\right) \times 100 = 83.3\%$

D) **Mid-point Frequency =** $\left(\frac{60\text{Hz} - 10\text{Hz}}{2}\right) + 10\text{Hz} = 35\text{Hz}$

Parameter Settings

P4.01: 01 – Positive Input Offset Polarity
P4.02: 16.7 – 16.7% Analog Input Offset
P4.03: 83.3 – 83.3% Analog Input Gain
P4.04: 00 (default) – Forward Motion Only

Results



Example 4: Forward and Reverse Operation

In this example, the potentiometer (or other analog signal device) is programmed to run a motor full-speed in both forward and reverse directions. The frequency reference will be 0Hz when the potentiometer is positioned at mid-point of its scale. Parameter P4.04 must be set to enable reverse motion.

When calculating the values for the Analog Input using reverse motion, the reverse frequency reference should be shown using a negative (-) number. Pay special attention to signs (+/-) for values representing reverse motion.

- Minimum Frequency Reference = -60 Hz (reverse)
- Maximum Frequency Reference = 60 Hz

Calculations

A) **Max. Output Frequency =** $\left(\frac{1750\ \text{rpm}}{1750\ \text{rpm}}\right) \times 60\text{Hz} = 60\text{Hz}$

B) **Analog Offset % =** $\left(\frac{-60\text{Hz}}{60\text{Hz}}\right) \times 100 = -100\%$

The negative (-) value for the Analog Offset % shows that a negative offset is needed for P4.01.

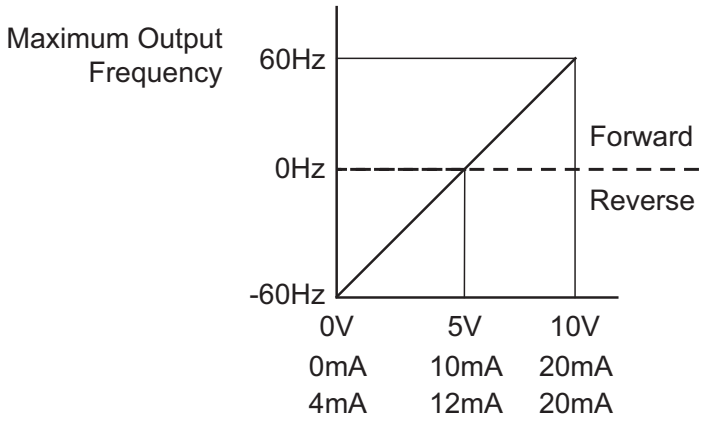
C) **Analog Gain % =** $\left(\frac{60\text{Hz} - (-60\text{Hz})}{60\text{Hz}}\right) \times 100 = 200\%$

D) **Mid-point Frequency =** $\left(\frac{60\text{Hz} - (-60\text{Hz})}{2}\right) + (-60\text{Hz}) = 0\text{Hz}$

Parameter Settings

P4.01: 02 – Negative Input Offset Polarity
P4.02: 100 – 100% Analog Input Offset
P4.03: 200 – 200% Analog Input Gain
P4.04: 01 – Reverse Motion Enable

Results



Example 5: Forward Run/Reverse Jog

This example shows an application in which the drive runs full-speed forward and jogs in reverse. The full scale of the potentiometer (or other analog signal device) will be used.

When calculating the values for the Analog Input using reverse motion, the reverse frequency reference should be shown using a negative (-) number. Pay special attention to signs (+/-) for values representing reverse motion.

- Minimum Frequency Reference = -15 Hz (reverse)
- Maximum Frequency Reference = 60 Hz

Calculations

A) **Max. Output Frequency =** $\left(\frac{1750\ RPM}{1750\ RPM}\right)$ x 60Hz = (60Hz)

B) **Analog Offset % =** $\left(\frac{-15Hz}{60Hz}\right)$ x 100 = (-25%)

The negative (-) value for the Analog Offset % shows that a negative offset is needed for P4.01.

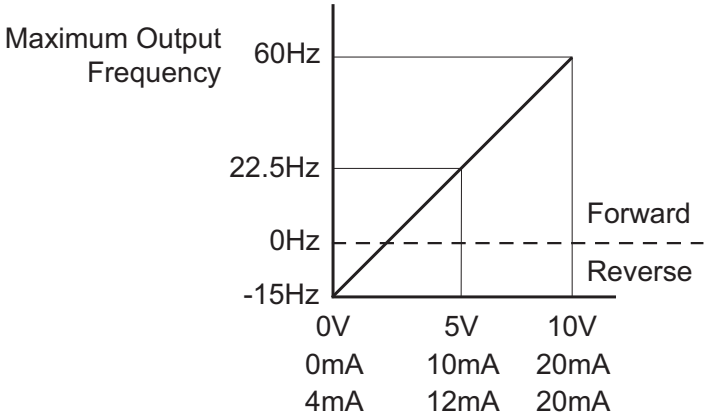
C) **Analog Gain % =** $\left(\frac{60Hz - (-15Hz)}{60Hz}\right)$ x 100 = (125%)

D) **Mid-point Frequency =** $\left(\frac{60Hz - (-15Hz)}{2}\right)$ + (-15Hz) = (22.5Hz)

Parameter Settings

P4.01: 02 – Negative Input Offset Polarity
P4.02: 25 – 25% Analog Input Offset
P4.03: 125 – 125% Analog Input Gain
P4.04: 01 – Reverse Motion Enable

Results



Example 6: Reduced Analog Gain

This example shows how to limit the Maximum Frequency Reference by reducing the Analog Input Gain. When the Analog Input is at its maximum value (10V or 20mA), the set-point frequency will be 50Hz. However, this reduced maximum frequency applies only to an Analog Input Source of Frequency Command. The Maximum Output Frequency can still can still go to 60 Hz if controlled from the Keypad, RS-485 interface, Jog Command, or Multi-Speed settings.

- Minimum Frequency Reference = 0Hz
- Maximum Frequency Reference = 50 Hz

Calculations

A) **Max. Output Frequency =** $\left(\frac{1750\ \text{rpm}}{1750\ \text{rpm}}\right) \times 60\text{Hz} = 60\text{Hz}$

B) **Analog Offset % =** $\left(\frac{0\text{Hz}}{50\text{Hz}}\right) \times 100 = 0\%$

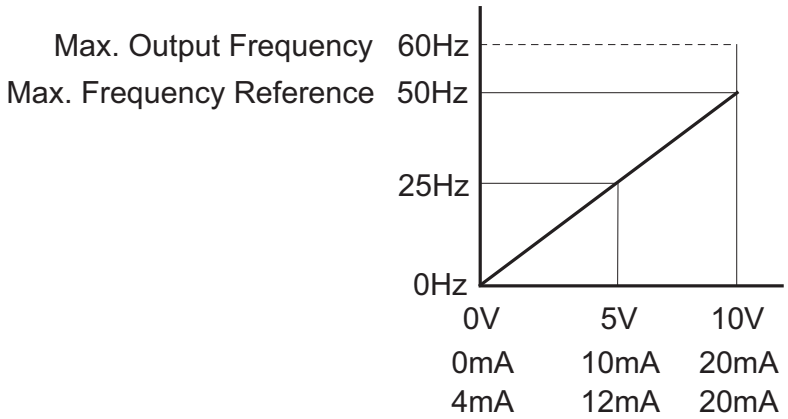
C) **Analog Gain % =** $\left(\frac{50\text{Hz} - (0\text{Hz})}{60\text{Hz}}\right) \times 100 = 83.3\%$

D) **Mid-point Frequency =** $\left(\frac{50\text{Hz} - (0\text{Hz})}{2}\right) + (0\text{Hz}) = 25\text{Hz}$

Parameter Settings

P4.01: 00 (default) – Offset disabled
P4.02: 00 (default) – 0% Analog Input Offset
P4.03: 83.3 – 83.3% Analog Input Gain
P4.04: 00 (default) – Forward Motion Only

Results

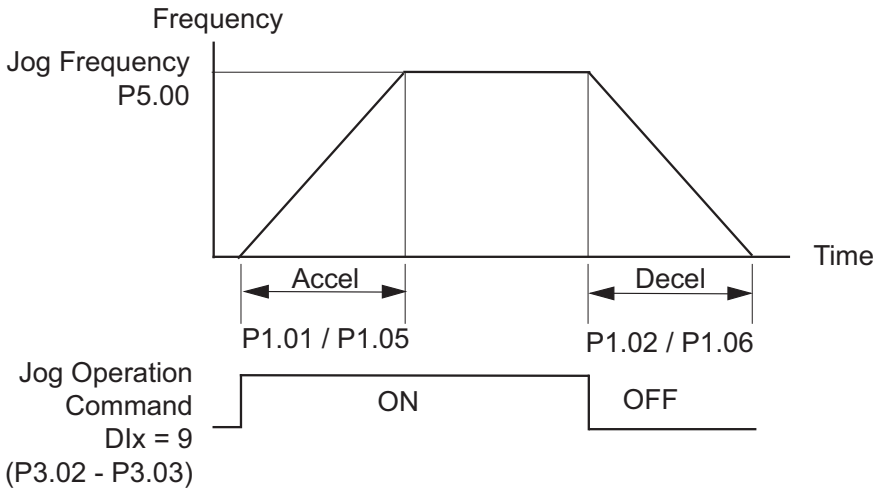


Presets Parameters

P5.00 ◆ Jog

Range: 0.0 to 400.0 Hz Default Setting: 6.0

- The Jog Command is selected by a Multi-Function Input Terminal (P3.02 and P3.03) set to the Jog Function (9).



P5.01 ◆ Multi-Speed 1

P5.02 ◆ Multi-Speed 2

P5.03 ◆ Multi-Speed 3

Range for P5.01 to P5.03: 0.0 to 400.0 Hz Default Setting: 0.0

- The Multi-Function Input Terminals are used to select one of the AC drive Multi-Step speeds. (DI3 or DI4 can be assigned as Multi-Speed Bit 1 or as Multi-Speed Bit 2; refer to P3.02 and P3.03) The speeds (frequencies) are determined by P5.01 to P5.03.

Multi-Speed Bits		Speed Selection
Bit 2	Bit 1	
OFF	OFF	P4.00: Source of Frequency
OFF	**ON**	P5.01: Multi-Speed 1
ON	OFF	P5.02: Multi-Speed 2
ON	**ON**	P5.03: Multi-Speed 3

When all multi-speed inputs are off, the AC drive reverts to the Command Frequency P4.00.

Protection Parameters

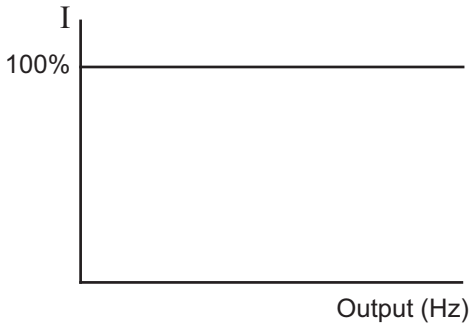
P6.00 Electronic Thermal Overload Relay

Default Setting: 00

Settings:

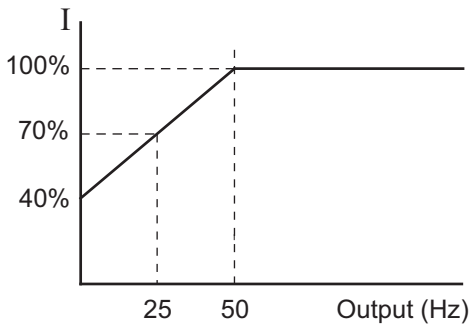
00 Constant Torque (Recommended **for inverter/vector duty motors**)

Use this setting when using the drives with motors designed specifically for AC drive outputs and for running at low speeds with high currents. Motor currents will be 100% throughout the speed range, and can be up to 150% for one minute.



01 Variable Torque (Recommended **for fan-cooled standard motors**)

Use this setting when using the drives with motors which are NOT designed specifically for AC drive outputs. Motors with shaft mounted fans offer poor cooling at low speeds; therefore the output can be derated at lower output frequencies. This derated current is for protecting the motor at lower speeds.



The output current is derated as follows:

- I_{output} (%) = [f_{output} (Hz) x 1.2 (% / Hz)] + 40%

Example:
If the rated motor current is 5A, and the output frequency is 25Hz, the derating will be 70%, and the overload will be 5.25A (150%) for one minute.

- I_{output} (%) = [(25Hz) (1.2 %/Hz)] + 40% = 70%
- 5A x 70% = 3.5A
- 3.5A x 150% = 5.25A

02 Inactive

This parameter determines the drive's motor overload protection characteristic. The Variable Torque setting (01) allows less motor current at lower speeds than does the Constant Torque setting (00).

P6.01 Auto Restart after Fault

Range: 0 to 10 Default Setting: 0

- After fault occurs (allowable faults: over-current OC, over-voltage OV), the AC drive can be reset/restarted automatically up to 10 times. Setting this parameter to 0 will disable the reset/restart operation after any fault has occurred. When enabled, the AC drive will restart with speed search, which starts at the previous Frequency. To set the fault recovery time after a fault, please see (P6.13) base-block time for speed search.

P6.02 Momentary Power Loss

Default Setting: 0

Settings:	0	Stop operation after momentary power loss.
	1	Continue operation after momentary power loss, speed search from Speed Reference.
	2	Continue operation after momentary power loss, speed search from Minimum Speed.

This parameter will only work if the Source of Operation (P3.00) is set to something other than 0 (Operation determined by digital keypad).

Refer also to P6.12 (Maximum Allowable Power Loss Time).

P6.03 Reverse Operation Inhibit

Default Setting: 0

Settings:	0	Enable Reverse Operation
	1	Disable Reverse Operation

This parameter determines whether the AC Motor Drive can operate in the reverse direction.

P6.04 Auto Voltage Regulation

Default Setting: 0

Settings:
0 AVR enabled
1 AVR disabled
2 AVR disabled during decel
3 AVR disabled during Stop

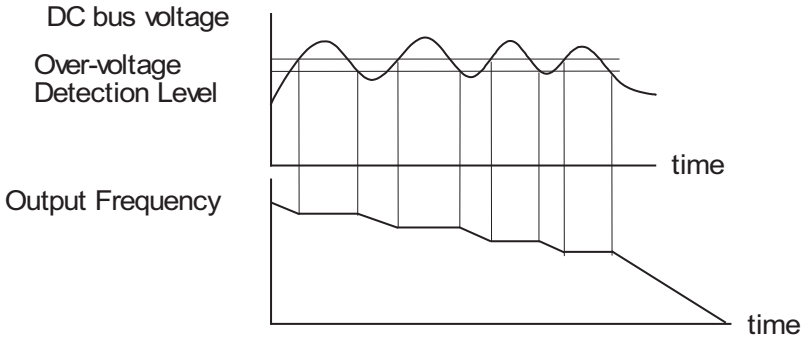
- AVR function automatically regulates the AC drive output voltage to the Maximum Output Voltage (P0.00). For instance, if P0.00 is set at 200 VAC and the input voltage is at 200V to 264VAC, then the Maximum Output Voltage will automatically be regulated to 200 VAC.
- Without AVR function, the Maximum Output Voltage may vary between 180V to 264VAC, due to the input voltage varying between 180V to 264 VAC.
- Selecting program value 2 enables the AVR function, but also disables the AVR function during deceleration. AVR improves regulation of the DC bus voltage. With lower DC bus voltage, regeneration and overvoltage faults are reduced, therefore allowing quicker deceleration.

P6.05 Over-Voltage Trip Prevention

Settings: 0 Enable Over-voltage Trip Prevention
1 Disable Over-voltage Trip Prevention

Default Setting: 0

- During deceleration, the AC drive DC bus voltage may exceed its Maximum Allowable Value due to motor regeneration. When this function is enabled, the AC drive will stop decelerating, and maintain a constant output frequency. The drive will resume deceleration when the voltage drops below the factory-preset value.



With moderate inertial loads, over-voltage during deceleration will not occur. For applications with high inertia loads, the AC drive will automatically extend the deceleration time.

P6.06 Auto Adjustable Accel/Decel

Default Setting: 0

Settings:		
	0	Linear Accel/Decel
	1	Auto Accel, Linear Decel
	2	Linear Accel, Auto Decel
	3	Auto Accel/Decel
	4	Auto Accel/Decel Stall Prevention

If the auto accel/decel is selected, the AC drive will accel/decel in the fastest and smoothest means possible by automatically adjusting the time of accel/decel.

This parameter provides five modes to choose:

- 0 Linear Acceleration and deceleration (Operation by P1.01, P1.02 or P1.05, P1.06 acceleration/deceleration time).
- 1 Automatic acceleration, linear deceleration (Operation by automatic acceleration time, P1.02 or P1.06 deceleration time).
- 2 Linear acceleration and automatic deceleration (Operation by automatic deceleration time, P1.01 or P1.05 acceleration time).
- 3 Automatic acceleration, deceleration (Operation by AC drive auto adjustable control).
- 4 Auto acceleration, deceleration. The auto accel/decel will not be quicker than the settings for acceleration (P1.01 or P1.05) or deceleration (P1.02 or P1.06). The operation is specific to preventing a stall.

P6.07 Over-Torque Detection Mode

Default Setting: 0

Settings:		
	0	Disabled
	1	Enabled during constant speed operation
	2	Enabled during acceleration

P6.08 Over-Torque Detection Level

Range: 30 to 200% Default Setting: 150

- A setting of 100% is proportional to the Rated Output Current of the drive.
- This parameter sets the Over-Torque Detection level in 1% increments. (The AC drive rated current is equal to 100%.)

P6.09 Over-Torque Detection Time

Range: 0.1 to 10.0 Default Setting: 0.1

This parameter sets the Over-Torque Detection Time in units of 0.1 seconds.

P6.10 Over-current Stall Prevention during Acceleration

Range: 20 to 200% Default Setting: 130

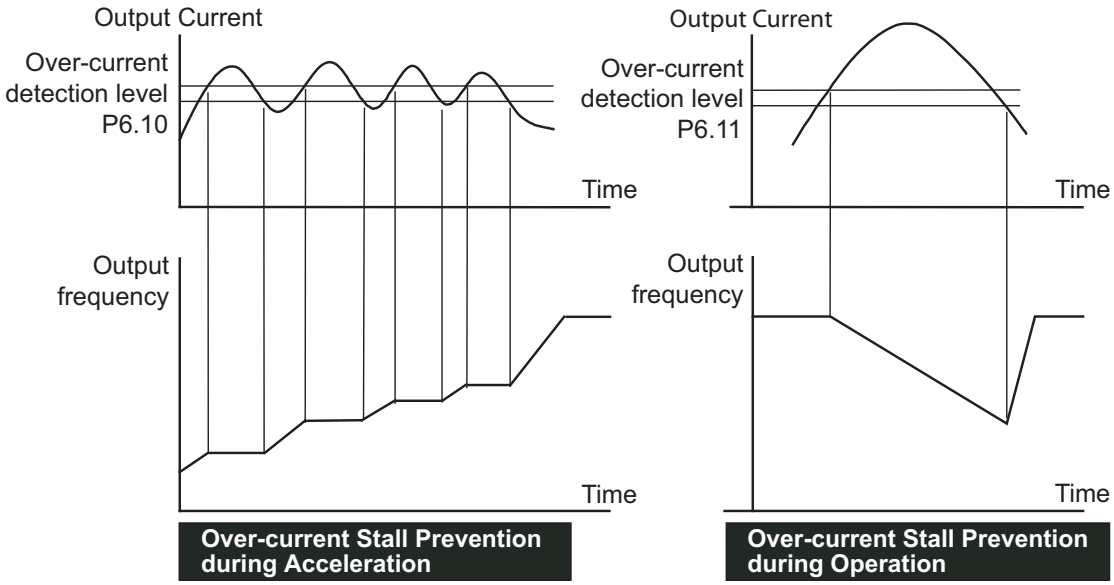
A setting of 100% is equal to the Rated Output Current of the drive.

- Under certain conditions, the AC drive output current may increase abruptly, and exceed the value specified by P6.10. This is commonly caused by rapid acceleration or excessive load on the motor. When this function is enabled, the AC drive will stop accelerating and maintain a constant output frequency. The AC drive will only resume acceleration when the current drops below the maximum value.

P6.11 Over-current Stall Prevention during Operation

Range: 20 to 200% Default Setting: 130

- During steady-state operation with motor load rapidly increasing, the AC drive output current may exceed the limit specified in P6.11. When this occurs, the output frequency will decrease to maintain a constant motor speed. The drive will accelerate to the steady-state output frequency only when the output current drops below the level specified by P6.11.



P6.12 Maximum Allowable Power Loss Time

Range: 0.3 to 5.0 sec Default Setting: 2.0

- During a power loss, if the power loss time is less than the time defined by this parameter, the AC drive will resume operation. If the Maximum Allowable Power Loss Time is exceeded, the AC drive output is turned off.

P6.13 Base-Block Time for Speed Search

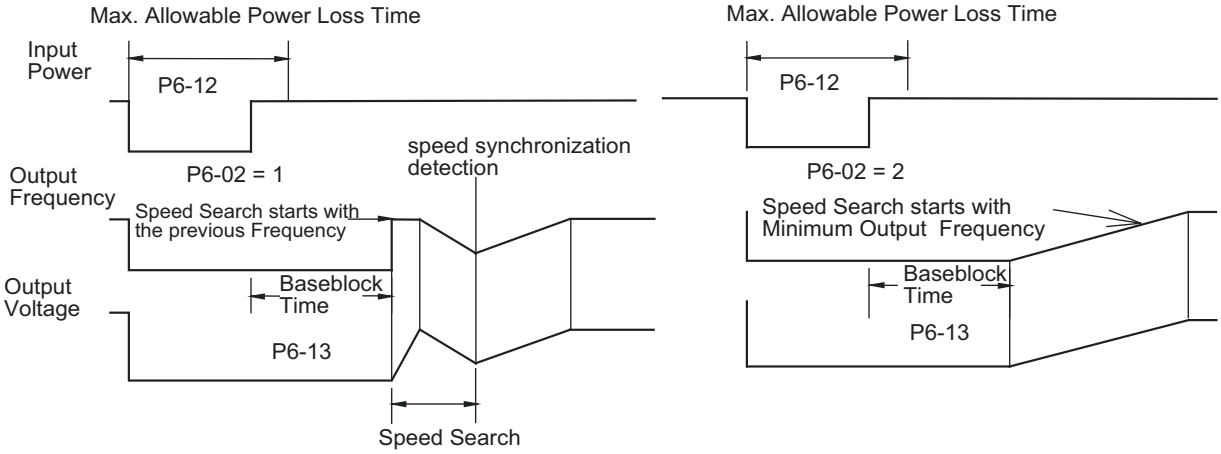
Range: 0.3 to 5.0 sec Default Setting: 0.5

- When a momentary power loss is detected, the AC drive turns off for a specified time interval determined by P6.13 before resuming operation. This time interval is called Base-Block. This parameter should be set to a value where the residual output voltage due to regeneration is nearly zero, before the drive resumes operation.
- This parameter also determines the searching time when performing external Base-Block and Fault Reset (P6.01).

P6.14 Maximum Speed Search Current Level

Range: 30 to 200% Default Setting: 150

- Following a power failure, the AC drive will start its speed search operation only if the output current is greater than the value determined by P6.14. When the output current is less than that of P6.14, the AC drive output frequency is at a "speed synchronization point". The drive will start to accelerate or decelerate back to the operating frequency at which it was running prior to the power failure.



P6.15 Upper Bound of Output Frequency

Range: 0.1 to 400 Hz Default Setting: 400.0

This parameter must be equal to or greater than the Lower Bound of Output Frequency (P6.16).

- The Upper/Lower Bound is to prevent operation error and machine damage.
- If the Upper Bound of Output Frequency is 50 Hz and the Maximum Output Frequency is 60 Hz, then any command frequency above 50 Hz will generate a 50 Hz output from the drive.
- The Output Frequency is also limited by the Motor Maximum RPM (P0.04).

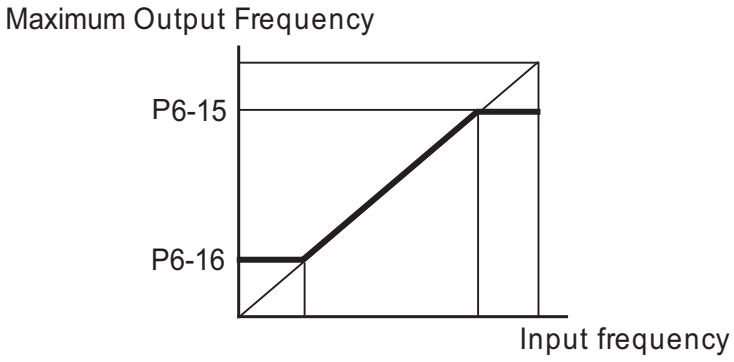
(Refer to diagram with P6.16.)

P6.16 Lower Bound of Output Frequency

Range: 0.0 to 400 Hz Default Setting: 0.0

This parameter must be less than or equal to the Upper Bound of Output Frequency (P6.15).

- The Upper/Lower Bound is to prevent operation error and machine damage.
- The Lower Bound of Output Frequency must be less than or equal to the Upper Bound of Output Frequency (P6.15).
- If the Lower Bound of Output Frequency is 10 Hz, and the Minimum Output Frequency (P2.06) is set at 1.0 Hz, then any Command Frequency between 1-10 Hz will generate a 10 Hz output from the drive.



P6.30 Line Start Lockout

Default Setting: 00

Settings:

00	Enable Line Start Lockout
01	Disable Line Start Lockout

When this parameter is enabled, the AC Drive will not start the motor when powered up with a RUN command already applied. The drive must see the RUN command change from STOP to RUN before it will start.

When this parameter is disabled, the AC Drive will start the motor when powered up with a RUN command already applied.

- This parameter is available only with AC drive firmware v1.07 or higher. Refer to P9.39 to determine the drive's firmware version.

P6.31 Present Fault Record

P6.32 Second Most Recent Fault Record

P6.33 Third Most Recent Fault Record

P6.34 Fourth Most Recent Fault Record

P6.35 Fifth Most Recent Fault Record

P6.36 Sixth Most Recent Fault Record

Default Setting: 0

Settings for P6.31 - P6.36:

0	No Fault occurred
1	Over-current (oc)
2	Over-voltage (ov)
3	Overheat (oH)
4	Overload (oL)
5	Overload 1 (oL1)
6	Overload 2 (oL2)
7	External Fault (EF)
8	CPU failure 1 (CF1)
9	CPU failure 2 (CF2)
10	CPU failure 3 (CF3)
11	Hardware Protection Failure (HPF)
12	Over-current during accel (OCA)
13	Over-current during decel (OCd)
14	Over-current during steady state (OCn)
18	External Base Block (bb)
19	Auto Adjust Accel/decel failure (cFA)
20	Software protection code (co)

Display Parameters

P8.00 ◆ User Defined Display Function

Default Setting: 0

Settings:		
	0	Output Frequency (Hz)
	1	Motor Speed (RPM)
	2	Output Frequency x P8.01
	3	Output Current (A)
	4	Motor Output Current (%)
	5	Output Voltage(V)
	6	DC Bus Voltage (V)
	9	Frequency Setpoint

P8.01 ◆ Frequency Scale Factor

Range: 0.1 to 160.0 Default Setting: 1.0

- The coefficient K determines the multiplying factor for the user-defined unit.
  - The display value is calculated as follows:

Display value = output frequency x K

  - The display window is only capable of showing four digits, but P8.01 can be used to create larger numbers. The display window uses decimal points to signify numbers up to three digits as explained below:

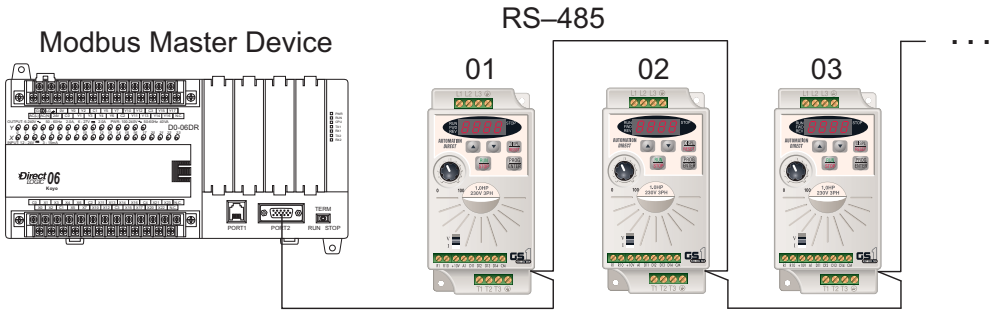
DISPLAY	***NUMBER REPRESENTED***
9999	The absence of a decimal point indicates a four digit integer.
999.9	A single decimal point between the middle and the right-most numbers is a true decimal point; it separates ones and tenths as in “30.5 (thirty and one-half).”
9999.	A single decimal point after the right-most number is not a true decimal point; instead it indicates that a zero follows the right-most numbers. For example, the number 1230 would be displayed as “123.”

Communication Parameters

P9.00 Communication Address

Range: 1 to 254 Default Setting: 1

- If the AC drive is controlled by RS-485 serial communication, the communication address must be set via this parameter.



P9.01 Transmission Speed

Default Setting: 1

Setting 0: 4800 baud data transmission speed
1: 9600 baud data transmission speed
2: 19200 baud data transmission speed

- Users can set parameters and control the operation of the AC drive via the RS-485 serial interface of a Modbus master. This parameter is used to set the transmission speed between the master and AC drive.

P9.02 Communication Protocol

Default Setting: 0

Settings:		
	0	MODBUS ASCII mode. <7 data bits, no parity, 2 stop bits>
	1	MODBUS ASCII mode <7 data bits, even parity, 1 stop bit>
	2	MODBUS ASCII mode <7 data bits, odd parity, 1 stop bit>
	3	MODBUS RTU mode <8 data bits, no parity, 2 stop bits>
	4	MODBUS RTU mode <8 data bits, even parity, 1 stop bit>
	5	MODBUS RTU mode <8 data bits, odd parity, 1 stop bit>

P9.03 Transmission Fault Treatment

Default Setting: 0

Settings: 0 - Display fault and continue operating
1 - Display fault and RAMP to stop
2 - Display fault and COAST to stop
3 - No fault displayed and continue operating

P9.04 Time Out Detection

Settings: 0 - Disable
1 - Enable

Default Setting: 0

- When this parameter is set to 01, the communications Time Out Detection is Enabled. If a delay in communications for more than the Time Out Duration (P9.05) is detected, the action selected by the Transmission Fault Treatment (P9.03) will be used.

P9.05 Time Out Duration

Range: 0.1 to 60.0 seconds

Default Setting: 0.5

P9.07 ◆ Parameter Lock

Settings: 0 - All parameters can be set and read
1 - All parameters are read-only

Default setting: 0

P9.08 Restore to Default

Range: 0 to 99

Default Setting: 0

•• Setting 99 restores all parameters to factory defaults. ••

P9.11 ◆ Block Transfer Parameter 1

Range: P0.00 to P8.01, and 9.99

Default Setting: 9.99

- Setting 9.99 disables the parameter.

The block transfer parameters (P9.11~P9.20) are used to read and write to and from non-consecutive drive addresses via Modbus.

P9.12 ◆ Block Transfer Parameter 2

Range: P0.00 to P8.01, and 9.99

Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.13 ◆ Block Transfer Parameter 3

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.14 ◆ Block Transfer Parameter 4

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.15 ◆ Block Transfer Parameter 5

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.16 ◆ Block Transfer Parameter 6

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.17 ◆ Block Transfer Parameter 7

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.18 ◆ Block Transfer Parameter 8

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.19 ◆ Block Transfer Parameter 9

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.20 ◆ Block Transfer Parameter 10

Range: P0.00 to P8.01, and 9.99 Default Setting: 9.99

- Setting 9.99 disables the parameter. (Refer to P9.11 for description.)

P9.26 ◆ Serial Comm Speed Reference

Range: 0.0 to 400.0 Hz Default Setting: 60.0

This parameter is used to set the Master Frequency when the AC drive is controlled by communication interface.

In order for this parameter to function, the Source of Frequency Command (P4.00) must be set to 5.

P9.27 ◆ Serial Comm RUN Command

Settings: 0 - Stop Default Setting: 0
1 - Run

- Do not attempt to both Run and Jog (P9.27 & P9.31) in one Modbus write command.

P9.28 ◆ Serial Comm Direction Command

Settings: 0 - Forward Default Setting: 0
1 - Reverse

P9.29 ◆ Serial Comm External Fault

Settings: 0 - No fault Default Setting: 0
1 - External fault

P9.30 ◆ Serial Comm Fault Reset

Settings: 0 - No action Default Setting: 0
1 - Fault Reset

P9.31 ◆ Serial Comm JOG Command

Settings: 0 - Stop Default Setting: 0
1 - Jog

- Do not attempt to both Run and Jog (P9.27 & P9.31) in one Modbus write command.

P9.39 Firmware Version

Settings: Read Only Default Setting: Factory Set

- This parameter is available only with AC drive firmware v1.07 or higher.

P9.41 GS Series Number

Default Setting: ##

Settings:	1	GS1
	2	GS2
	3	GS3
	4	GS4

P9.42 Manufacturer Model Information

Default Setting: ##

Settings:	0	GS1-10P2 (115V, 1ph, 0.25hp)
	1	GS1-10P5 (115V, 1ph, 0.5hp)
	2	GS1-20P2 (230V, 1ph/3ph, 0.25hp)
	3	GS1-20P5 (230V, 1ph/3ph, 0.5hp)
	4	GS1-21P0 (230V, 1ph/3ph, 1hp)
	5	GS1-22P0 (230V, 3ph, 2hp)